FIG. 1(a)

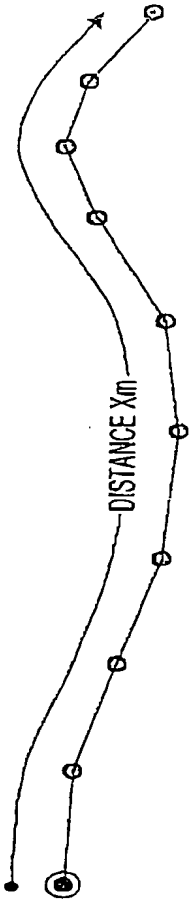


FIG. 1(b) QUANTIZATION OF SAMPLING POINTS IN THE DIRECTION OF DISTANCE

FIG. 1(c) QUANTIZATION OF TRAFFIC INFORMATION (SPEED)

FIG. 1(d) DIFFERENCE REPRESENTATION OF STATISTICAL PREDICTION VALUE

FIG. 2

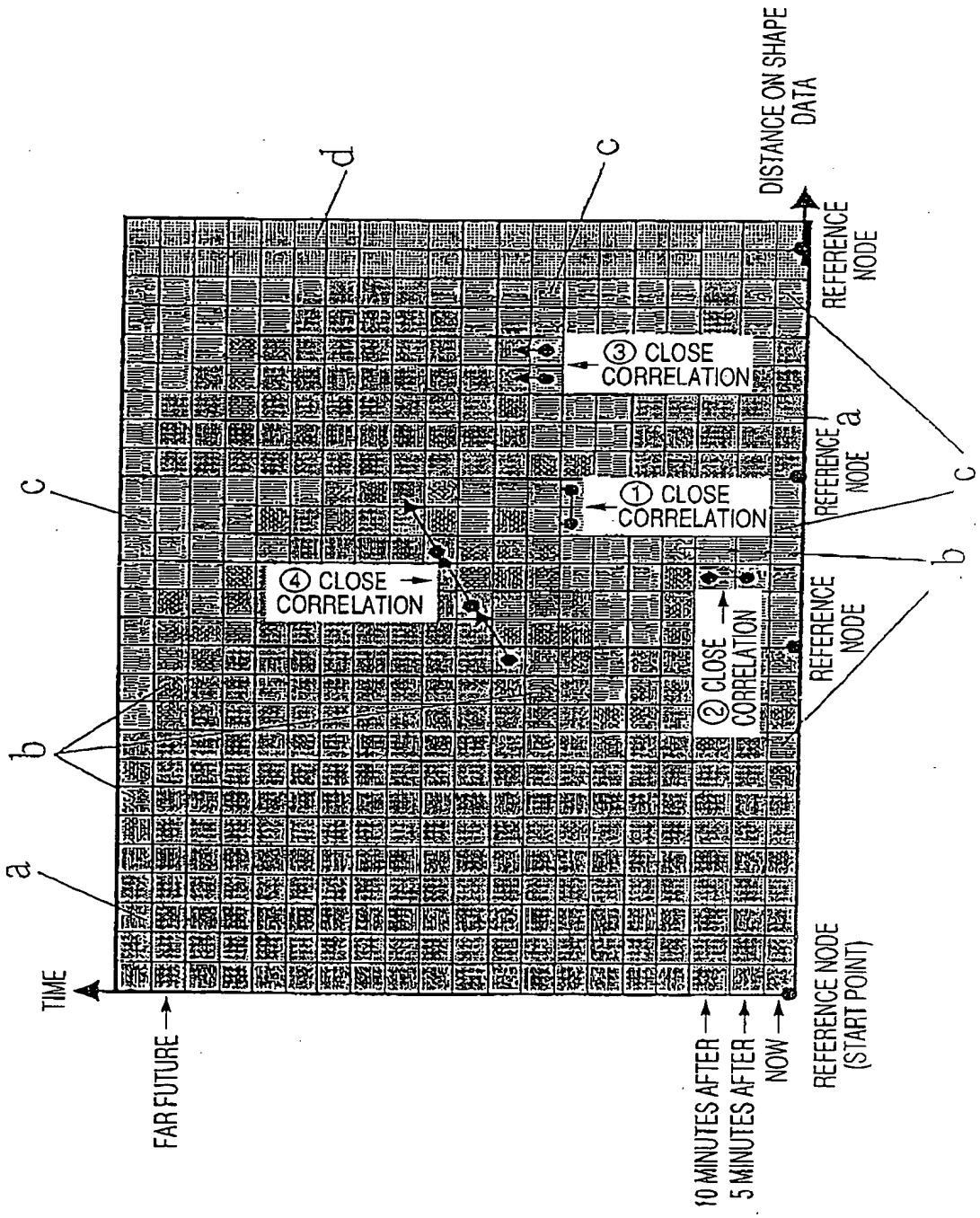

DISTANCE ON SHAPE DATA
REFERENCE NODE
③ CLOSE CORRELATION
REFERENCE NODE
① CLOSE CORRELATION
④ CLOSE CORRELATION
② CLOSE CORRELATION
REFERENCE NODE
REFERENCE NODE (START POINT)
TIME
FAR FUTURE
10 MINUTES AFTER
5 MINUTES AFTER
NOW
a
b
c
d

FIG. 3

TRAFFIC INFORMATION QUANTIZATION TABLE (SPEED QUANTIZATION TABLE)

QUANTIZED VOLUME	SPEED (km/h)
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10~11
11	12~13
12	14~15
13	16~17
14	18~19
15	20~24
16	25~29
17	30~34
18	35~39
19	40~44
20	45~49
21	50~59
22	60~69
23	70~79
24	80~99
⟆	
30	200 OR MORE

FIG. 4

EXAMPLE OF ENCODING TABLE OF STATISTICAL PREDICTION DIFFERENCE VALUE OF TRAFFIC INFORMATION

SPECIAL CODE		CODE	ADDITIONAL BIT	
SECTION LENGTH CHANGE CODE		101	3 (40/80/160/···/5120m)	
TRAFFIC INFORMATION QUANTIZATION TABLE CHANGE CODE		111110	4 (TABLE NUMBER)	
IDENTIFICATION CODE FOR A POINT CORRESPONDING TO REFERENCE NODE		1100	6 (CORRESPONDING REFERENCE NODE NUMBER) + 8 (OFFSET DISTANCE FROM REFERENCE NODE)	
ENCODING TABLE FOR STATISTICAL PREDICTION DIFFERENCE VALUES OF TRAFFIC INFORMATION		CODE	ADDITIONAL BIT I	ADDITIONAL BIT II (RANGE)
RUN LENGTH	CHANGE VOLUME			
0	0	0	0	–
5	0	100	0	–
10	0	1101	0	–
0	±1	1110	1 (±IDENTIFICATION)	0
0	±2	111100	1 (±IDENTIFICATION)	0
0	±4	111101	1 (±IDENTIFICATION)	1 (3 OR 4)
⟩				

FIG. 5

EXAMPLE OF APPARATUS CONFIGURATION
(APPLICATION TO CAR NAVIGATION SYSTEM)

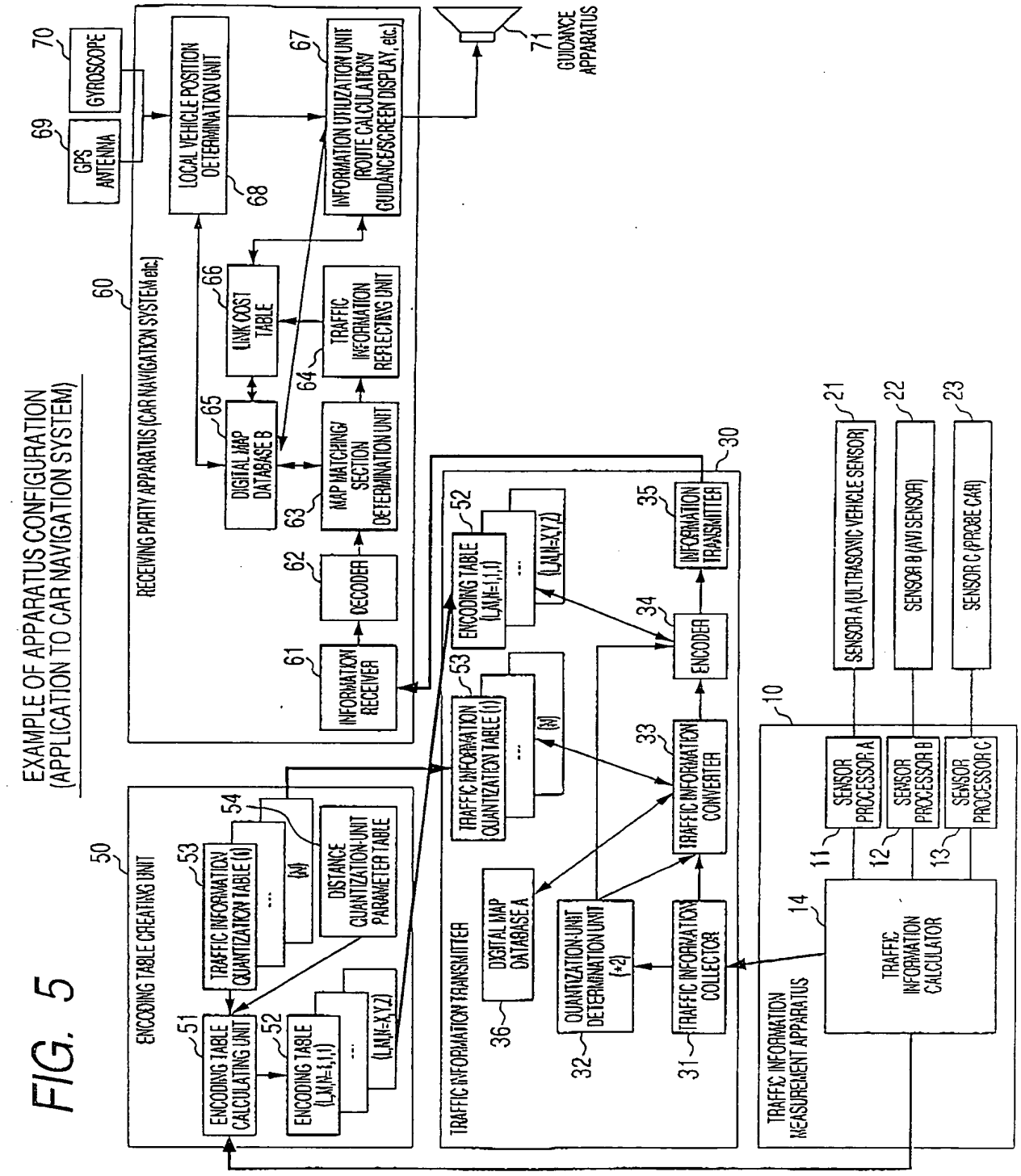


FIG. 6

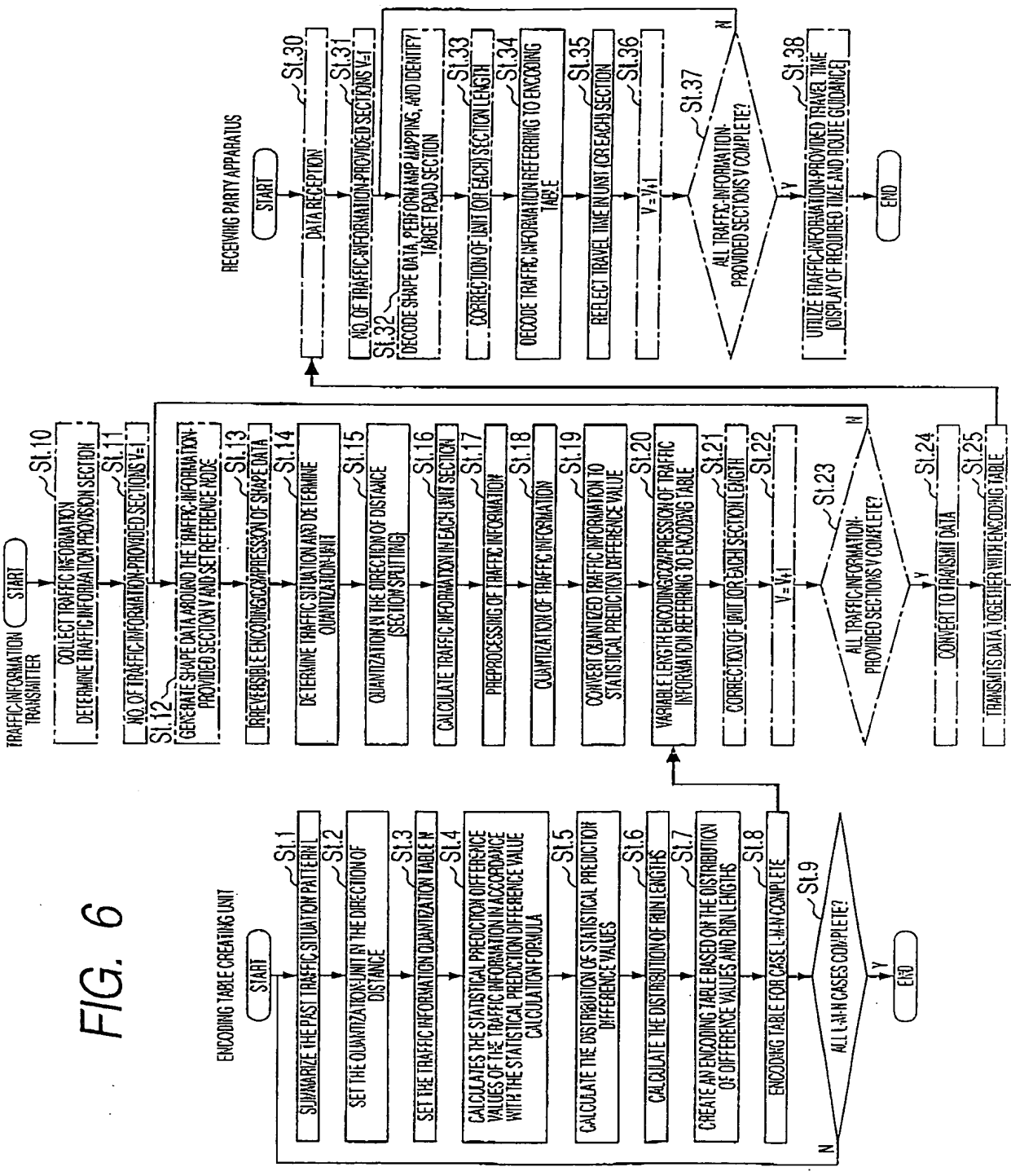

ENCODING TABLE CREATING UNIT
START
S1.1 SUMMARIZE THE PAST TRAFFIC SITUATION PATTERN
S1.2 SET THE QUANTIZATION UNIT IN THE DIRECTION OF DISTANCE
S1.3 SET THE TRAFFIC INFORMATION QUANTIZATION TABLE N
S1.4 CALCULATES THE STATISTICAL PREDICTION DIFFERENCE VALUES OF THE TRAFFIC INFORMATION IN ACCORDANCE WITH THE STATISTICAL PREDICTION DIFFERENCE VALUE CALCULATION FORMULA
S1.5 CALCULATE THE DISTRIBUTION OF STATISTICAL PREDICTION DIFFERENCE VALUES
S1.6 CALCULATE THE DISTRIBUTION OF RUN LENGTHS
S1.7 CREATE AN ENCODING TABLE BASED ON THE DISTRIBUTION OF DIFFERENCE VALUES AND RUN LENGTHS
S1.8 ENCODING TABLE FOR CASE L-M-N COMPLETE
S1.9 ALL L-M-N CASES COMPLETE?
N
Y
END
TRAFFIC-INFORMATION TRANSMITTER
START
S1.10 COLLECT TRAFFIC INFORMATION
DETERMINE TRAFFIC INFORMATION PROVISION SECTION
S1.11 NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS V=1
S1.12 GENERATE SHAPE DATA AROUND THE TRAFFIC-INFORMATION-PROVIDED SECTION V AND SET REFERENCE NODE
S1.13 IRREVERSIBLE ENCODING/COMPRESSION OF SHAPE DATA
S1.14 DETERMINE TRAFFIC SITUATION AND DETERMINE QUANTIZATION UNIT
S1.15 QUANTIZATION IN THE DIRECTION OF DISTANCE (SECTION SPLITTING)
S1.16 CALCULATE TRAFFIC INFORMATION IN EACH UNIT SECTION
S1.17 PREPROCESSING OF TRAFFIC INFORMATION
S1.18 QUANTIZATION OF TRAFFIC INFORMATION
S1.19 CONVERT QUANTIZED TRAFFIC INFORMATION TO STATISTICAL PREDICTION DIFFERENCE VALUE
S1.20 VARIABLE LENGTH ENCODING/COMPRESSION OF TRAFFIC INFORMATION REFERRING TO ENCODING TABLE
S1.21 CORRECTION OF UNIT FOR EACH SECTION LENGTH
S1.22 V=V+1
S1.23 ALL TRAFFIC-INFORMATION-PROVIDED SECTIONS V COMPLETE?
N
Y
S1.24 CONVERT TO TRANSMIT DATA
S1.25 TRANSMITS DATA TOGETHER WITH ENCODING TABLE
END
RECEIVING PARTY APPARATUS
START
S1.30 DATA RECEPTION
S1.31 NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS V=1
S1.32 DECODE SHAPE DATA, PERFORM MAP MAPPING, AND IDENTIFY TARGET ROAD SECTION
S1.33 CORRECTION OF UNIT FOR EACH SECTION LENGTH
S1.34 DECODE TRAFFIC INFORMATION REFERRING TO ENCODING TABLE
S1.35 REFLECT TRAVEL TIME IN UNIT FOR EACH SECTION
S1.36 V=V+1
S1.37 ALL TRAFFIC-INFORMATION-PROVIDED SECTIONS V COMPLETE?
N
Y
S1.38 UTILIZE TRAFFIC-INFORMATION-PROVIDED TRAVEL TIME (DISPLAY OF REQUIRED TIME AND ROUTE GUIDANCE)
END

FIG. 7(a)

EXAMPLE OF MAP DATA STRUCTURE

MANAGEMENT INFORMATION (INFORMATION TYPE/BLOCK DEFINITION, ETC.)	
NO. OF NODES N	
NODE NUMBER 1	
NODE ATTRIBUTE INFORMATION OF NODE 1	
LONGITUDE OF NODE 1	LATITUDE OF NODE 1
NO. OF NODES CONNECTED TO NODE 1	
CONNECTING NODE NUMBER #1	LINK NUMBER #1-1
⌇	
CONNECTING NODE NUMBER #m	LINK NUMBER #1-m
⌇ ⌇	
NODE NUMBER N	
NODE ATTRIBUTE INFORMATION OF NODE N	
LONGITUDE OF NODE N	LATITUDE OF NODE N
NO. OF NODES CONNECTED TO NODE N	
CONNECTING NODE NUMBER #1	LINK NUMBER #N-1
⌇	
CONNECTING NODE NUMBER #m	LINK NUMBER #N-m
NO. OF LINK L	
LINK NUMBER 1	
LINK ATTRIBUTE INFORMATION OF LINK 1	
NO. OF COMPONENT INTERPOLATION POINTS OF LINK 1	
LONGITUDE OF INTERPOLATION POINT 1-1	LATITUDE OF INTERPOLATION POINT 1-1
⌇	
LONGITUDE OF INTERPOLATION POINT 1-p	LATITUDE OF INTERPOLATION POINT 1-p
⌇ ⌇	
LINK NUMBER L	
LINK ATTRIBUTE INFORMATION OF LINK L	
NO. OF COMPONENT INTERPOLATION POINTS OF LINK L	
LONGITUDE OF INTERPOLATION POINT L-1	LATITUDE OF INTERPOLATION POINT L-1
~	
LONGITUDE OF INTERPOLATION POINT L-p	LATITUDE OF INTERPOLATION POINT L-p

FIG. 7(b)

EXAMPLE OF TRAFFIC INFORMATION DATA (EXAMPLE OF TRAVEL TIME/SPEED)

MAP DATA LINK NUMBER 1	
CURRENT: TRAVEL TIME	CURRENT: SPEED
5 MINUTES AFTER: TRAVEL TIME	5 MINUTES AFTER: SPEED
10 MINUTES AFTER: TRAVEL TIME	10 MINUTES AFTER: SPEED
⌇	
Z MINUTES AFTER: TRAVEL TIME	Z MINUTES AFTER: SPEED
⌇ ⌇	
MAP DATA LINK NUMBER K	
CURRENT: TRAVEL TIME	CURRENT: SPEED
5 MINUTES AFTER: TRAVEL TIME	5 MINUTES AFTER: SPEED
10 MINUTES AFTER: TRAVEL TIME	10 MINUTES AFTER: SPEED
⌇	
Z MINUTES AFTER: TRAVEL TIME	Z MINUTES AFTER: SPEED
⌇ ⌇	

FIG. 8(a)

SHAPE DATA STRING INFORMATION (CODING/COMPRESSION DATA)

HEADER INFORMATION
NO. OF SHAPE DATA N
SHAPE DATA IDENTIFICATION NUMBER=1
ENCODING TABLE IDENTIFICATION CODE
ACCURACY INFORMATION OF MAP DATA AT SHAPE SOURCE
DIRECTION OF ONE-WAY TRAFFIC (FORWARD/BACKWARD/NONE)
BEGINNING NODE NUMBER ps
NODE ps X DIRECTION ABSOLUTE COORDINATE (LONGITUDE)
NODE ps Y DIRECTION ABSOLUTE COORDINATE (LATITUDE)
NODE ps ABSOLUTE BEARING
ps POSITION ERROR (m) / ps BEARING ERROR (°)
MAXIMUM POSITION ERROR OF ENCODED SHAPE DATAT (m) / MAXIMUM BEARING ERROR OF ENCODED SHAPE DATAT (°)
ENCODED SHAPE DATA INCLUDES THE FOLLOWING INFORMATION: · REFERENCE NODE SETTING CODE · SECTION LENGTH CHANGE CODE · EOD CODE
END NODE NUMBER pe
NODE pe X DIRECTION RELATIVE COORDINATE (LONGITUDE)
NODE pe Y DIRECTION RELATIVE COORDINATE (LATITUDE)
NODE pe ABSOLUTE BEARING
pe POSITION ERROR (m) / pe BEARING ERROR (°)
⟆
SHAPE DATA IDENTIFICATION NUMBER=M
⟆

FIG. 8(b)

TRAFFIC INFORMATION

HEADER INFORMATION
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER 1
REFERENCE SHAPE DATA STRING NUMBER=N
DIRECTION IDENTIFICATION FLAG (FORWARD/BACKWARD)
BEGINNING REFERENCE NODE Pa / END REFERENCE NODE Pb
DISTANCE DIRECTION QUANTIZED SECTION LENGTH IDENTIFICATION CODE
TRAFFIC INFORMATION QUANTIZATION TABLE IDENTIFICATION CODE
ENCODING TABLE IDENTIFICATION CODE
NO. OF QUANTIZED UNIT SECTIONS
TRAFFIC INFORMATION AT THE BEGINNING (INITIAL VALUE)
TRAFFIC INFORMATION ENCODED BY THE DIFFERENCE VALUE FROM STATISTICAL PREDICTION VALUE. INCLUDES THE FOLLOWING INFORMATION; · SECTION LENGTH CHANGE CODE AND SECTION LENGTH AFTER CHANGE · TRAFFIC INFORMATION QUANTIZATION TABLE CHANGE CODE AND TABLE NUMBER AFTER CHANGE · IDENTIFICATION CODE FOR THE POINT CORRESPONDING TO REFERENCE NODE AND CORRESPONDING REFERENCE NODE NUMBER+OFFSET DISTANCE
⟆
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER=W
⟆

FIG. 9

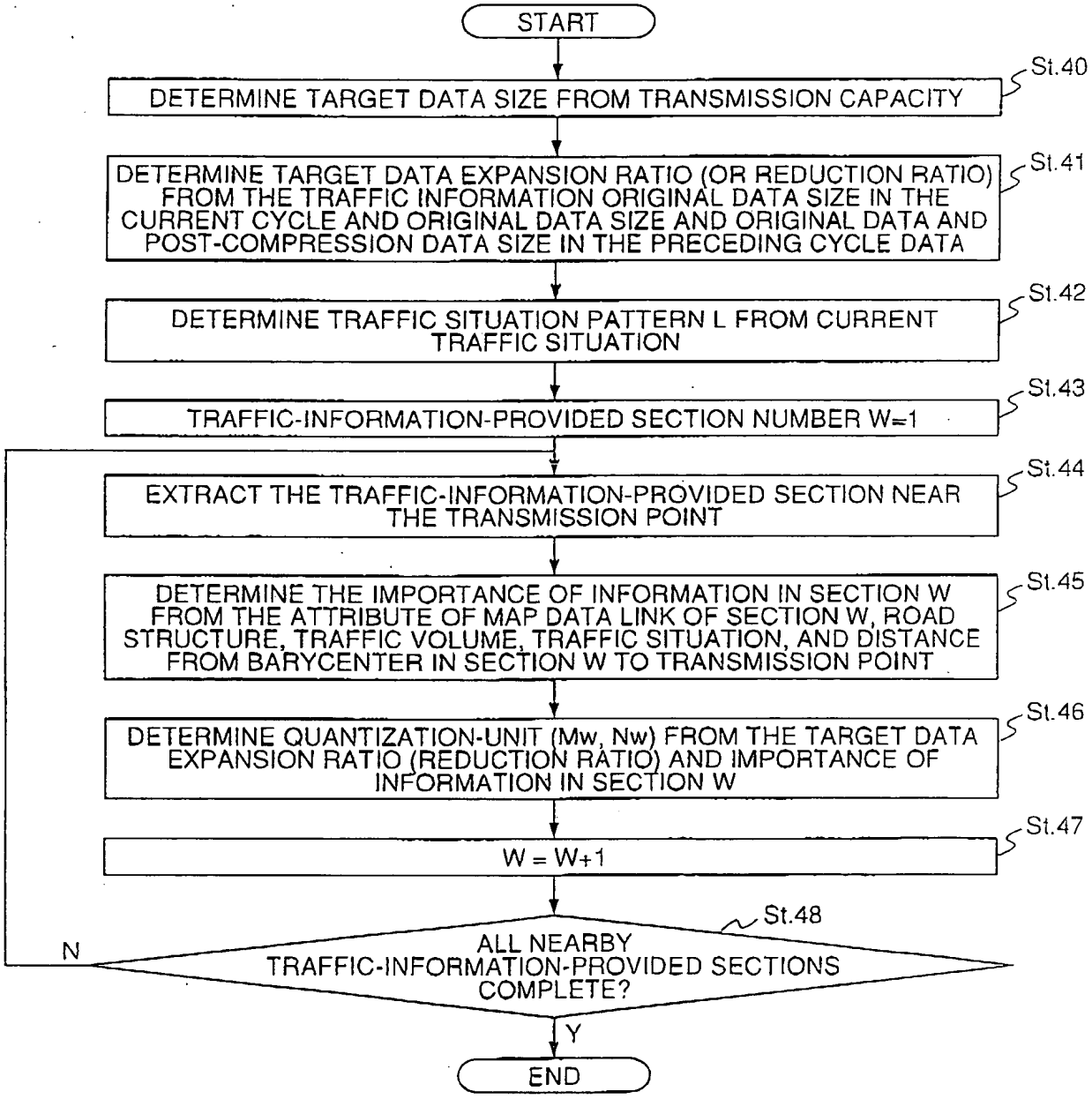

START
DETERMINE TARGET DATA SIZE FROM TRANSMISSION CAPACITY
St.40
DETERMINE TARGET DATA EXPANSION RATIO (OR REDUCTION RATIO) FROM THE TRAFFIC INFORMATION ORIGINAL DATA SIZE IN THE CURRENT CYCLE AND ORIGINAL DATA SIZE AND ORIGINAL DATA AND POST-COMPRESSION DATA SIZE IN THE PRECEDING CYCLE DATA
St.41
DETERMINE TRAFFIC SITUATION PATTERN L FROM CURRENT TRAFFIC SITUATION
St.42
TRAFFIC-INFORMATION-PROVIDED SECTION NUMBER W=1
St.43
EXTRACT THE TRAFFIC-INFORMATION-PROVIDED SECTION NEAR THE TRANSMISSION POINT
St.44
DETERMINE THE IMPORTANCE OF INFORMATION IN SECTION W FROM THE ATTRIBUTE OF MAP DATA LINK OF SECTION W, ROAD STRUCTURE, TRAFFIC VOLUME, TRAFFIC SITUATION, AND DISTANCE FROM BARYCENTER IN SECTION W TO TRANSMISSION POINT
St.45
DETERMINE QUANTIZATION-UNIT (Mw, Nw) FROM THE TARGET DATA EXPANSION RATIO (REDUCTION RATIO) AND IMPORTANCE OF INFORMATION IN SECTION W
St.46
W = W+1
St.47
ALL NEARBY TRAFFIC-INFORMATION-PROVIDED SECTIONS COMPLETE?
St.48
N
Y
END

FIG. 10(a)

TARGET DATA EXPANSION RATIO	IMPORTANCE OF INFORMATION A	IMPORTANCE OF INFORMATION B	IMPORTANCE OF INFORMATION C	REMARKS
DEFAULT	RANK 2	RANK 3	RANK 4	–
×2.0 OR ABOVE	+1 RANK	+2 RANK	+3 RANK	DETAILED
×1.6–1.9	±0 RANK	+1 RANK	+2 RANK	↑
×1.1–1.3	±0 RANK	±0 RANK	+1 RANK	↑
×1.0	±0 RANK	±0 RANK	±0 RANK	NOT CHANGED
×0.7–0.9	±0 RANK	±0 RANK	−1 RANK	↓
×0.6–0.5	±0 RANK	−1 RANK	−2 RANK	↓
×0.4 OR BELOW	−1 RANK	−2 RANK	−3 RANK	SIMPLIFIED

FIG. 10(b)

QUANTIZATION-UNIT RANK	DISTANCE DIRECTION QUANTIZATION-UNIT M	TRAFFIC INFORMATION QUANTIZATION TABLE N	DETAIL LEVEL
RANK 1	50m	TABLE 1	DETAILED
RANK 2	100m	TABLE 2	RATHER DETAILED
RANK 3	150m	TABLE 2	STANDARD
RANK 4	200m	TABLE 3	RATHER COARSE
RANK 5	200m	TABLE 4	COARSE

FIG. 11

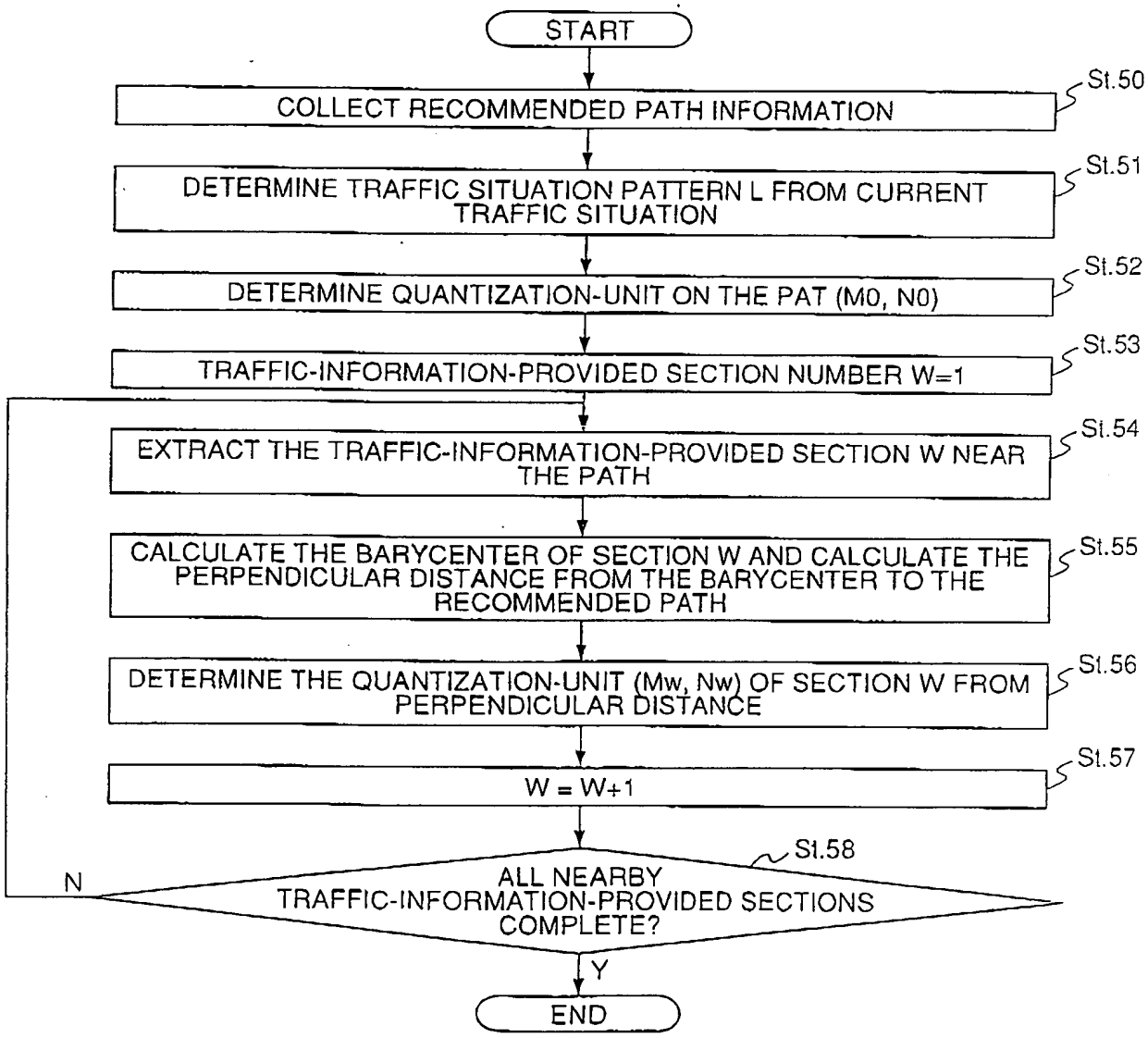

START
COLLECT RECOMMENDED PATH INFORMATION
St.50
DETERMINE TRAFFIC SITUATION PATTERN L FROM CURRENT TRAFFIC SITUATION
St.51
DETERMINE QUANTIZATION-UNIT ON THE PAT (M0, N0)
St.52
TRAFFIC-INFORMATION-PROVIDED SECTION NUMBER W=1
St.53
EXTRACT THE TRAFFIC-INFORMATION-PROVIDED SECTION W NEAR THE PATH
St.54
CALCULATE THE BARYCENTER OF SECTION W AND CALCULATE THE PERPENDICULAR DISTANCE FROM THE BARYCENTER TO THE RECOMMENDED PATH
St.55
DETERMINE THE QUANTIZATION-UNIT (Mw, Nw) OF SECTION W FROM PERPENDICULAR DISTANCE
St.56
W = W+1
St.57
ALL NEARBY TRAFFIC-INFORMATION-PROVIDED SECTIONS COMPLETE?
St.58
N
Y
END

FIG. 12

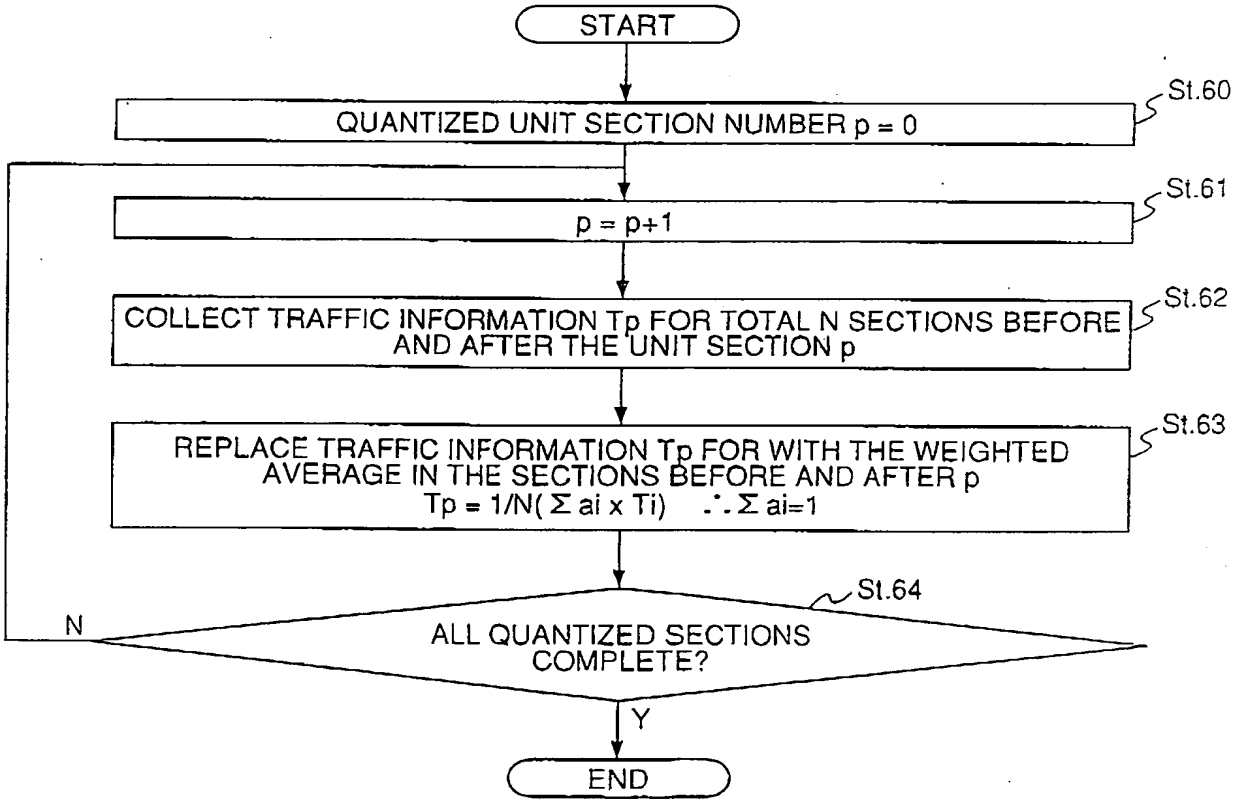

START
QUANTIZED UNIT SECTION NUMBER p = 0
St.60
p = p+1
St.61
COLLECT TRAFFIC INFORMATION Tp FOR TOTAL N SECTIONS BEFORE AND AFTER THE UNIT SECTION p
St.62
REPLACE TRAFFIC INFORMATION Tp FOR WITH THE WEIGHTED AVERAGE IN THE SECTIONS BEFORE AND AFTER p
Tp = 1/N(Σ ai x Ti) ∴ Σ ai=1
St.63
ALL QUANTIZED SECTIONS COMPLETE?
St.64
N
Y
END

FIG. 13(a)

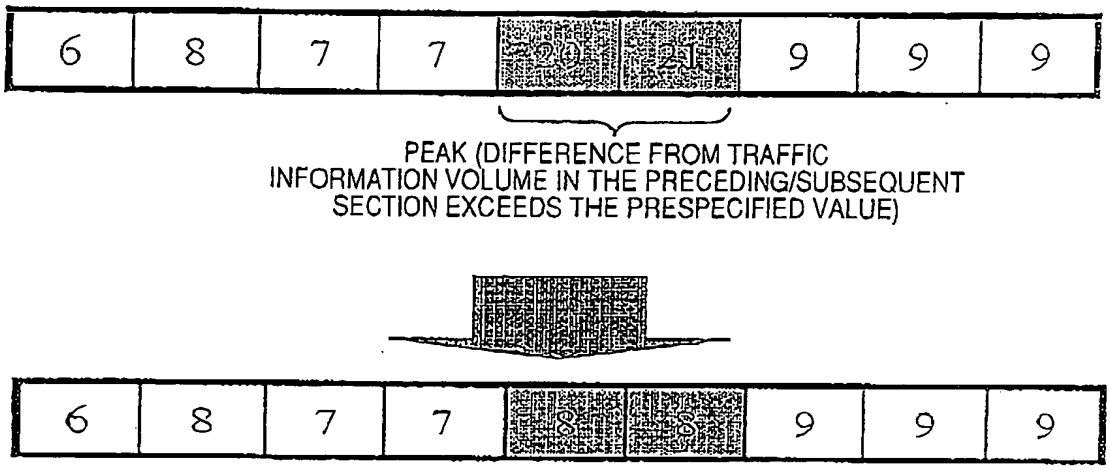


FIG. 13(b)

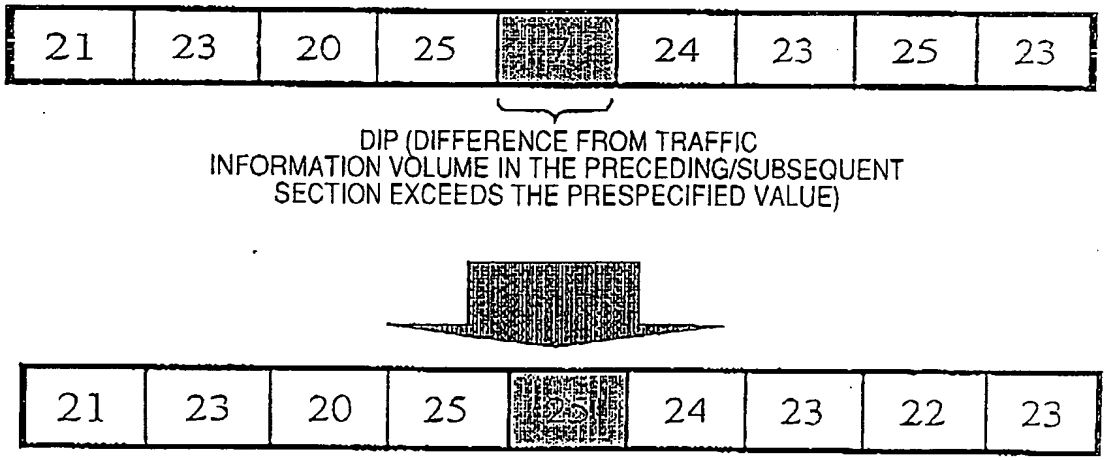
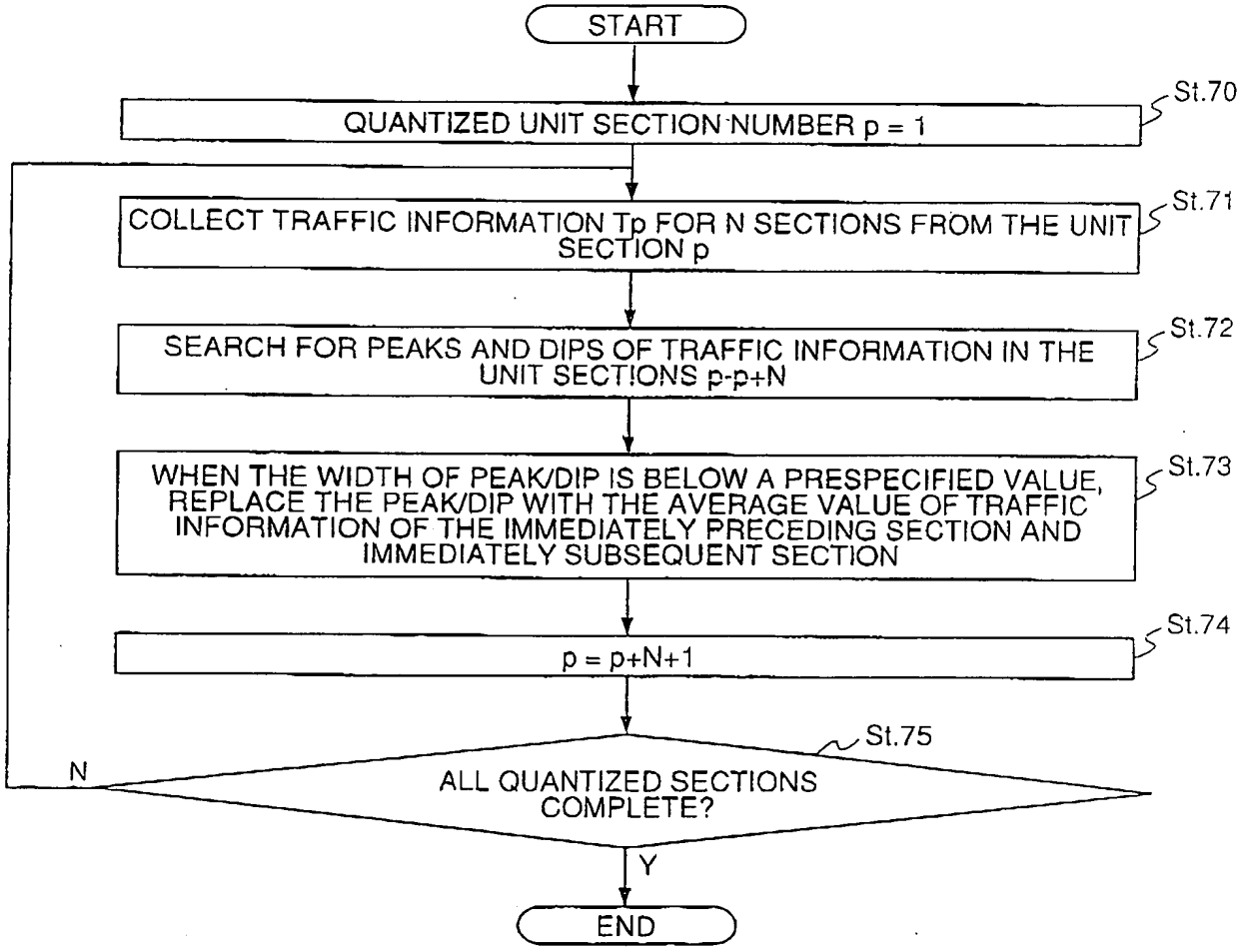


FIG. 14


START
QUANTIZED UNIT SECTION NUMBER p = 1
St.70
COLLECT TRAFFIC INFORMATION Tp FOR N SECTIONS FROM THE UNIT SECTION p
St.71
SEARCH FOR PEAKS AND DIPS OF TRAFFIC INFORMATION IN THE UNIT SECTIONS p-p+N
St.72
WHEN THE WIDTH OF PEAK/DIP IS BELOW A PRESPECIFIED VALUE, REPLACE THE PEAK/DIP WITH THE AVERAGE VALUE OF TRAFFIC INFORMATION OF THE IMMEDIATELY PRECEDING SECTION AND IMMEDIATELY SUBSEQUENT SECTION
St.73
p = p+N+1
St.74
ALL QUANTIZED SECTIONS COMPLETE?
St.75
N
Y
END

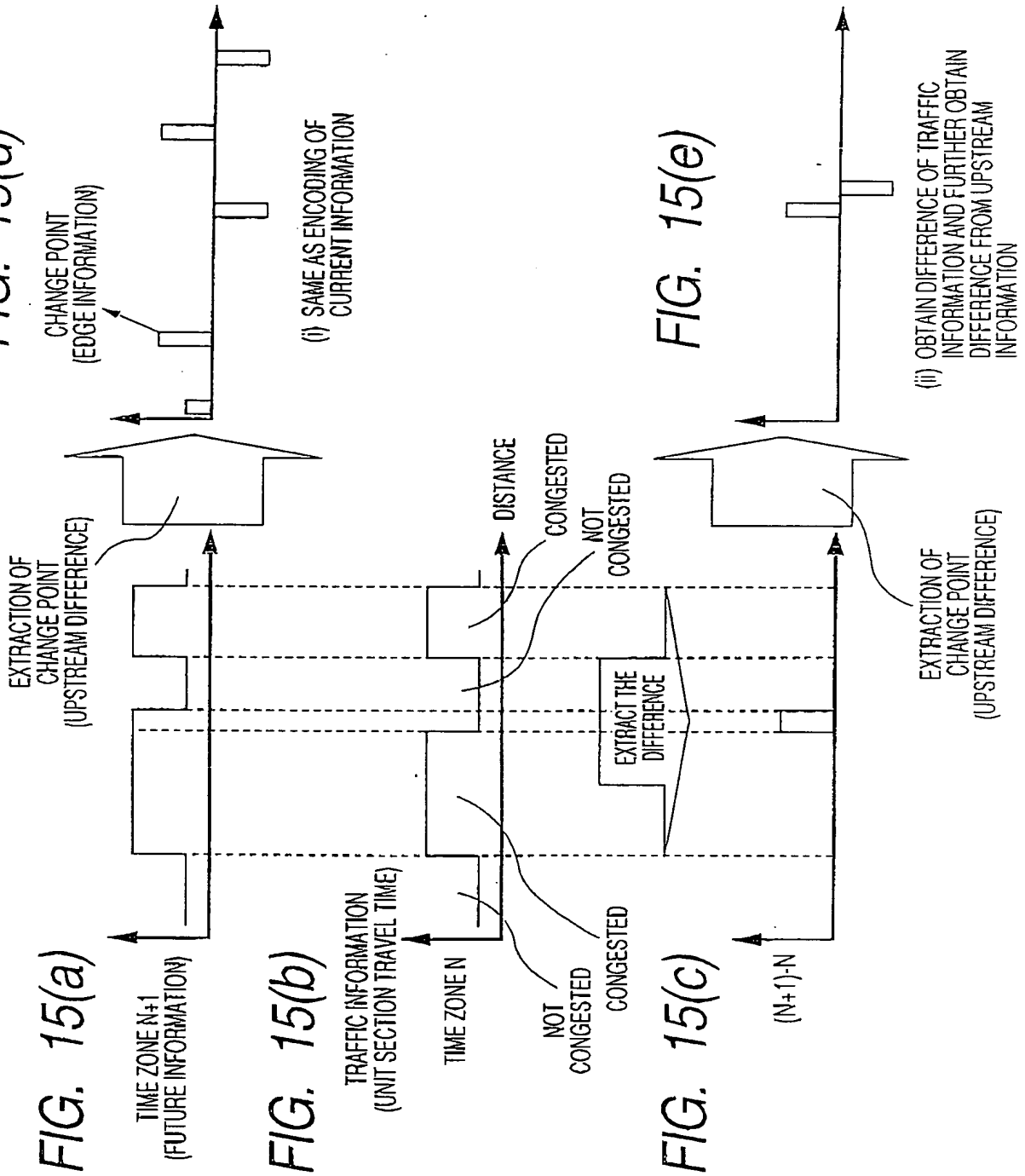


FIG. 15(a)
TIME ZONE N+1
(FUTURE INFORMATION)
FIG. 15(b)
TRAFFIC INFORMATION
(UNIT SECTION TRAVEL TIME)
TIME ZONE N
NOT CONGESTED
CONGESTED
DISTANCE
CONGESTED
NOT CONGESTED
EXTRACT THE DIFFERENCE
FIG. 15(c)
(N+1)-N
EXTRACTION OF CHANGE POINT
(UPSTREAM DIFFERENCE)
FIG. 15(d)
EXTRACTION OF CHANGE POINT
(UPSTREAM DIFFERENCE)
CHANGE POINT
(EDGE INFORMATION)
(i) SAME AS ENCODING OF CURRENT INFORMATION
FIG. 15(e)
(ii) OBTAIN DIFFERENCE OF TRAFFIC INFORMATION AND FURTHER OBTAIN DIFFERENCE FROM UPSTREAM INFORMATION

CALCULATION EXAMPLE OF (ii)

FIG. 16(a)

1. ORIGINAL TRAFFIC INFORMATION (CURRENT MEASUREMENT VALUE+PREDICTION INFORMATION OF NEXT TIME ZONE)

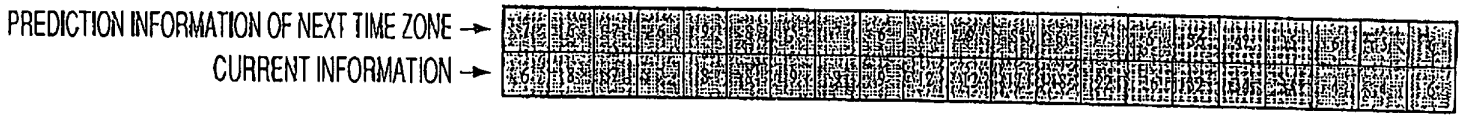


FIG. 16(b)

2. QUANTIZED REPRESENTATION OF TRAFFIC INFORMATION

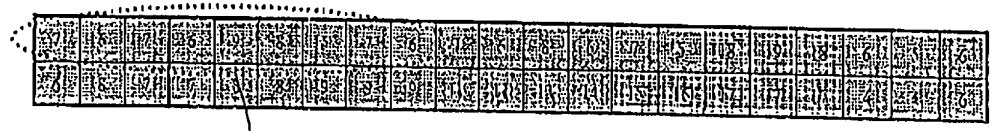


FIG. 16(c)

3. REPRESENT PREDICTION INFORMATION BY THE DIFFERENCE FROM CURRENT INFORMATION (CURRENT INFORMATION IS REPRESENTED BY THE DIFFERENCE FROM AN ADJACENT UNIT SECTION)

CONCENTRATES AROUND ±0 FROM CORRELATION LAW B

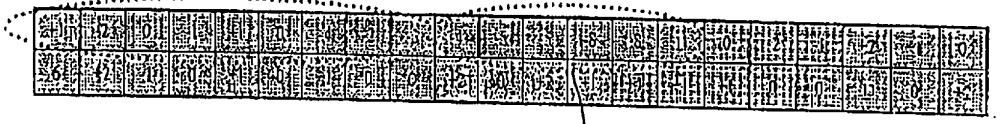


FIG. 16(d)

CONCENTRATES AROUND ±0 FROM CORRELATION LAW C

4. REPRESENT PREDICTION INFORMATION BY THE DIFFERENCE FROM AN ADJACENT UNIT SECTION

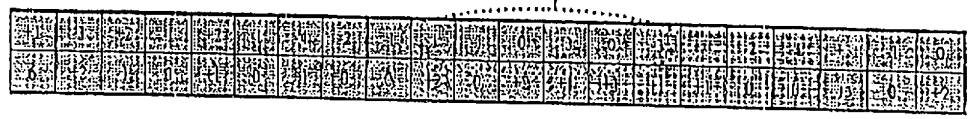


FIG. 17(a)

SPECIAL CODE		CODE	ADDITIONAL BIT	
SECTION LENGTH CHANGE CODE		101	3 (40/80/160/···/5120m)	
TRAFFIC INFORMATION QUANTIZATION TABLE CHANGE CODE		111110	4 (TABLE NUMBER)	
IDENTIFICATION CODE FOR A POINT CORRESPONDING TO REFERENCE NODE		1100	6 (CORRESPONDING REFERENCE NODE NUMBER) + 8 (OFFSET DISTANCE FROM REFERENCE NODE)	
ENCODING TABLE FOR STATISTICAL PREDICTION DIFFERENCE VALUES OF TRAFFIC INFORMATION		CODE	ADDITIONAL BIT I	ADDITIONAL BIT II (RANGE)
RUN LENGTH	CHANGE VOLUME			
0	0	0	0	-
5	0	100	0	-
10	0	1101	0	-
0	±1	1110	1 (±IDENTIFICATION)	0
0	±2	111100	1 (±IDENTIFICATION)	0
0	±4	111101	1 (±IDENTIFICATION)	1 (3 OR 4)
S				

FIG. 17(b)

SPECIAL CODE		CODE	ADDITIONAL BIT	
NOT				
ENCODING TABLE FOR STATISTICAL PREDICTION DIFFERENCE VALUES OF PREDICTION INFORMATION		CODE	ADDITIONAL BIT I	ADDITIONAL BIT II (RANGE)
RUN LENGTH	CHANGE VOLUME			
0	0	0	0	-
5	0	100	0	-
10	0	1101	0	-
0	±1	1110	1 (±IDENTIFICATION)	0
0	±2	111100	1 (±IDENTIFICATION)	0
0	±4	111101	1 (±IDENTIFICATION)	1 (3 OR 4)
S				

FIG. 18

EXAMPLE OF APPARATUS CONFIGURATION
(APPLICATION TO CAR NAVIGATION SYSTEM)

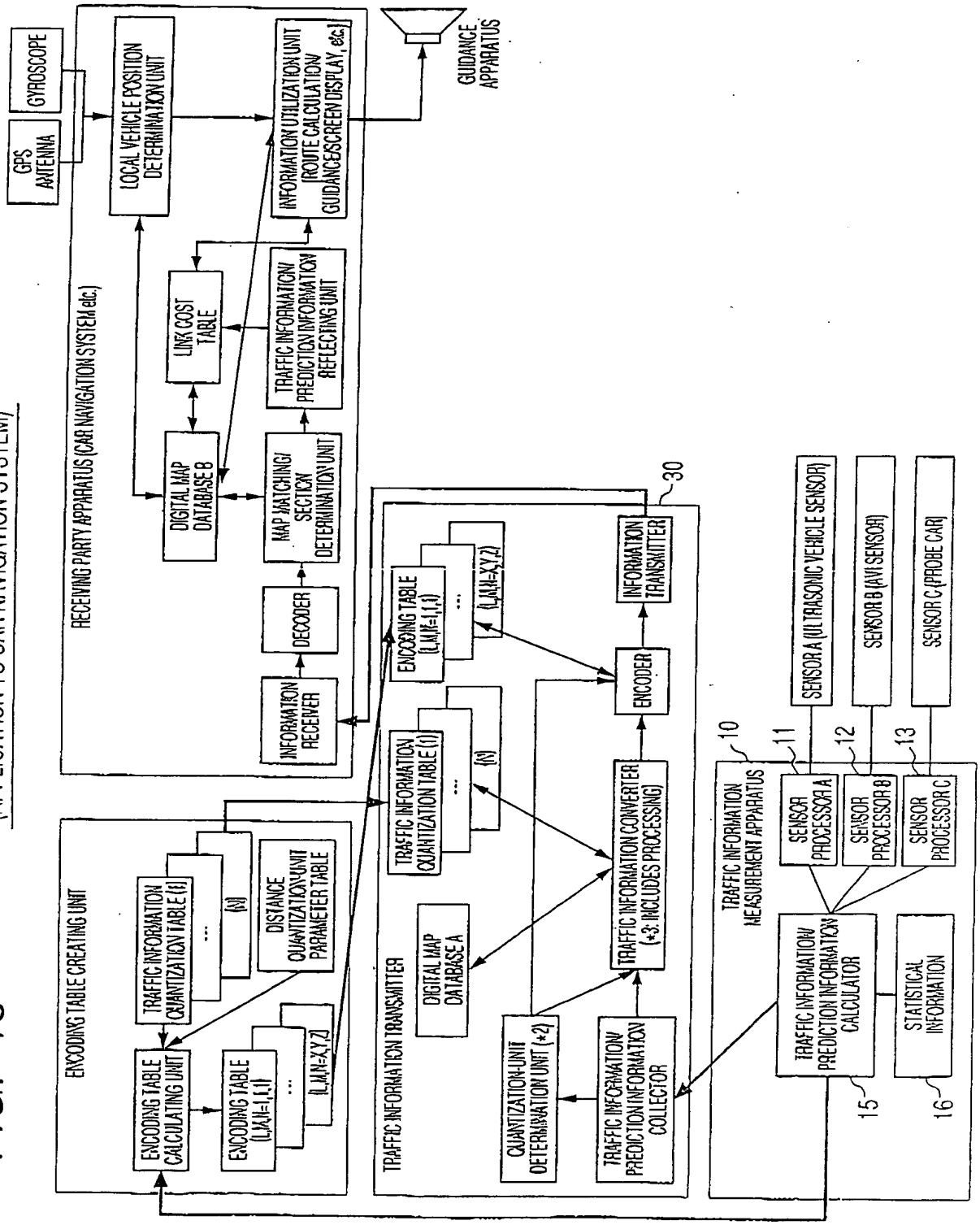


FIG. 19

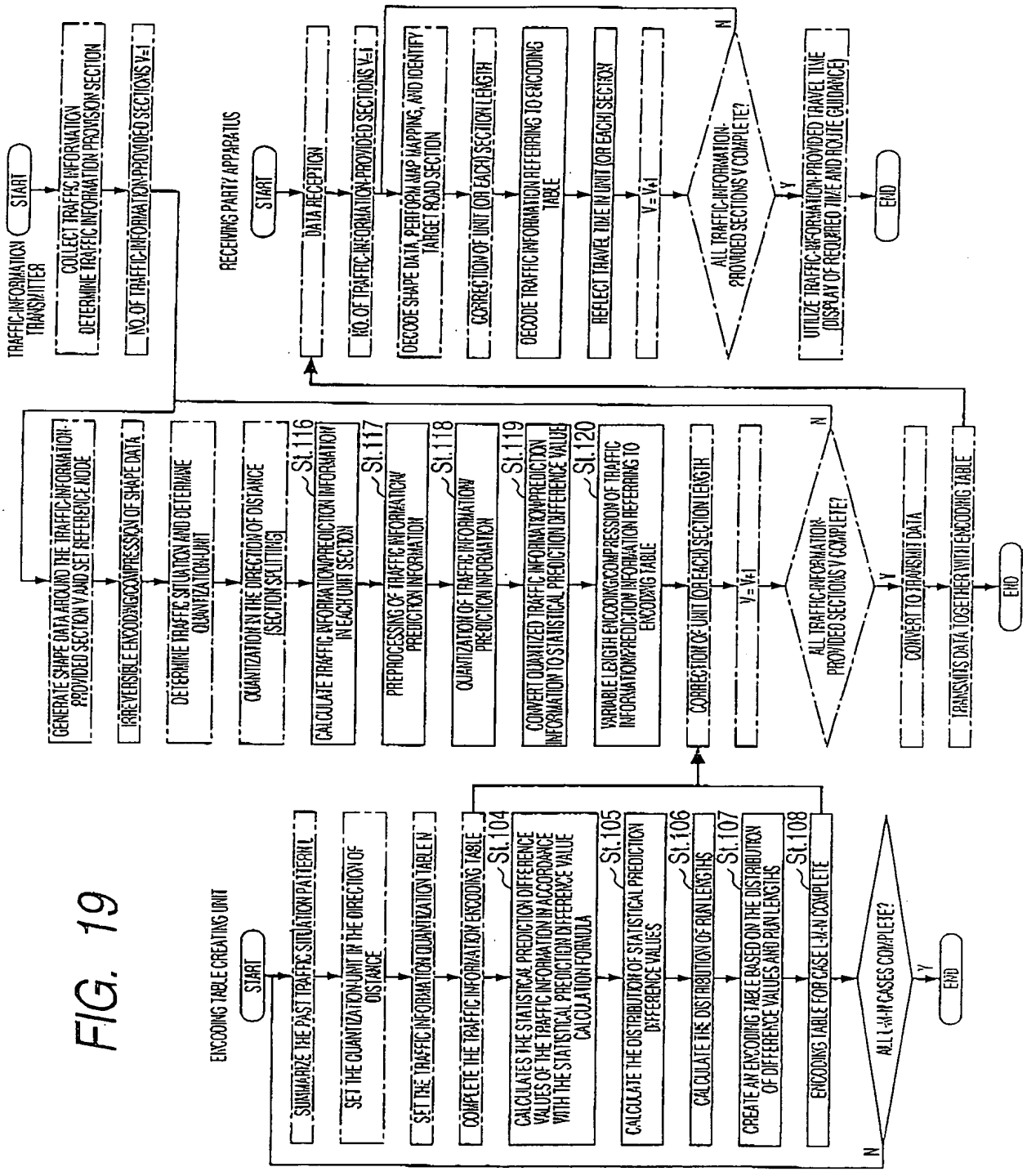

ENCODING TABLE CREATING UNIT
START
SUMMARIZE THE PAST TRAFFIC SITUATION PATTERN L
SET THE QUANTIZATION UNIT IN THE DIRECTION OF DISTANCE
SET THE TRAFFIC INFORMATION QUANTIZATION TABLE N
COMPLETE THE TRAFFIC INFORMATION ENCODING TABLE
St.104
CALCULATES THE STATISTICAL PREDICTION DIFFERENCE VALUES OF THE TRAFFIC INFORMATION IN ACCORDANCE WITH THE STATISTICAL PREDICTION DIFFERENCE VALUE CALCULATION FORMULA
St.105
CALCULATE THE DISTRIBUTION OF STATISTICAL PREDICTION DIFFERENCE VALUES
St.106
CALCULATE THE DISTRIBUTION OF RUN LENGTHS
St.107
CREATE AN ENCODING TABLE BASED ON THE DISTRIBUTION OF DIFFERENCE VALUES AND RUN LENGTHS
St.108
ENCODING TABLE FOR CASE L=N COMPLETE
ALL L=N CASES COMPLETE?
N
Y
END
TRAFFIC-INFORMATION TRANSMITTER
START
COLLECT TRAFFIC INFORMATION DETERMINE TRAFFIC INFORMATION PROVISION SECTION
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS V=1
GENERATE SHAPE DATA AROUND THE TRAFFIC-INFORMATION-PROVIDED SECTION V AND SET REFERENCE MODE
IRREVERSIBLE ENCODING/COMPRESSION OF SHAPE DATA
DETERMINE TRAFFIC SITUATION AND DETERMINE QUANTIZATION UNIT
QUANTIZATION IN THE DIRECTION OF DISTANCE (SECTION SPLITTING)
St.116
CALCULATE TRAFFIC INFORMATION/PREDICTION INFORMATION IN EACH UNIT SECTION
St.117
PREPROCESSING OF TRAFFIC INFORMATION/ PREDICTION INFORMATION
St.118
QUANTIZATION OF TRAFFIC INFORMATION/ PREDICTION INFORMATION
St.119
CONVERT QUANTIZED TRAFFIC INFORMATION/PREDICTION INFORMATION TO STATISTICAL PREDICTION DIFFERENCE VALUE
St.120
VARIABLE LENGTH ENCODING/COMPRESSION OF TRAFFIC INFORMATION/PREDICTION INFORMATION REFERRING TO ENCODING TABLE
CORRECTION OF UNIT FOR EACH SECTION LENGTH
V=V+1
ALL TRAFFIC-INFORMATION-PROVIDED SECTIONS V COMPLETE?
N
Y
CONVERT TO TRANSMIT DATA
TRANSMITS DATA TOGETHER WITH ENCODING TABLE
END
RECEIVING PARTY APPARATUS
START
DATA RECEPTION
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS V=1
DECODE SHAPE DATA, PERFORM MAP MAPPING, AND IDENTIFY TARGET ROAD SECTION
CORRECTION OF UNIT FOR EACH SECTION LENGTH
DECODE TRAFFIC INFORMATION REFERRING TO ENCODING TABLE
REFLECT TRAVEL TIME IN UNIT FOR EACH SECTION
V=V+1
ALL TRAFFIC-INFORMATION-PROVIDED SECTIONS V COMPLETE?
N
Y
UTILIZE TRAFFIC-INFORMATION-PROVIDED TRAVEL TIME DISPLAY OF REQUIRED TIME AND ROUTE GUIDANCE
END

FIG. 20(a)

SHAPE DATA STRING INFORMATION

HEADER INFORMATION	
NO. OF SHAPE DATA N	
SHAPE DATA IDENTIFICATION NUMBER=1	
ENCODING TABLE IDENTIFICATION CODE	
ACCURACY INFORMATION OF MAP DATA AT SHAPE SOURCE	
DIRECTION OF ONE-WAY TRAFFIC (FORWARD/BACKWARD/NONE)	
BEGINNING NODE NUMBER ps	
NODE ps X DIRECTION ABSOLUTE COORDINATE (LONGITUDE)	
NODE ps Y DIRECTION ABSOLUTE COORDINATE (LATITUDE)	
NODE ps ABSOLUTE BEARING	
ps POSITION ERROR (m)	ps BEARING ERROR (°)
MAXIMUM POSITION ERROR OF ENCODED SHAPE DATAT (m)	MAXIMUM BEARING ERROR OF ENCODED SHAPE DATAT (°)
ENCODED SHAPE DATA INCLUDES THE FOLLOWING INFORMATION: · REFERENCE NODE SETTING CODE · SECTION LENGTH CHANGE CODE · EOD CODE	
END NODE NUMBER pe	
NODE pe X DIRECTION RELATIVE COORDINATE (LONGITUDE)	
NODE pe Y DIRECTION RELATIVE COORDINATE (LATITUDE)	
NODE pe ABSOLUTE BEARING	
pe POSITION ERROR (m)	pe BEARING ERROR (°)
⌇	
SHAPE DATA IDENTIFICATION NUMBER=M	
⌇	

FIG. 20(b)

TRAFFIC INFORMATION

HEADER INFORMATION		
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS		
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER 1		
REFERENCE SHAPE DATA STRING NUMBER=N		
DIRECTION IDENTIFICATION FLAG (FORWARD/BACKWARD)		
BEGINNING REFERENCE NODE Pa	END REFERENCE NODE Pb	
DISTANCE DIRECTION QUANTIZED SECTION LENGTH IDENTIFICATION CODE		
TRAFFIC INFORMATION QUANTIZATION TABLE IDENTIFICATION CODE		
CURRENT INFORMATION: ENCODING TABLE IDENTIFICATION CODE		
PREDICTION INFORMATION: ENCODING TABLE IDENTIFICATION CODE		★
NO. OF QUANTIZED UNIT SECTIONS		
NO. OF TIME ZONES OF PREDICTION INFORMATION		★
EFFECTIVE TIME OF CURRENT INFORMATION (HH:MM)		★
TRAFFIC INFORMATION AT THE BEGINNING (INITIAL VALUE)		
CURRENT TRAFFIC INFORMATION ENCODED USING STATISTICAL PREDICTION DIFFERENCE VALUE FROM AN ADJACENT POINT		
EFFECTIVE TIME OF PREDICTION INFORMATION 1 (HH:MM)		★
PREDICTION TRAFFIC INFORMATION ENCODED USING THE DIFFERENCE FROM PRECEDING TIME ZONE AND STATISTICAL PREDICTION DIFFERENCE VALUE FROM AN ADJACENT POINT		★
⌇		★
EFFECTIVE TIME OF PREDICTION INFORMATION Q (HH:MM)		
PREDICTION TRAFFIC INFORMATION ENCODED USING THE DIFFERENCE FROM PRECEDING TIME ZONE AND STATISTICAL PREDICTION DIFFERENCE VALUE FROM AN ADJACENT POINT		★
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER=2		
⌇		

FIG. 21(a)

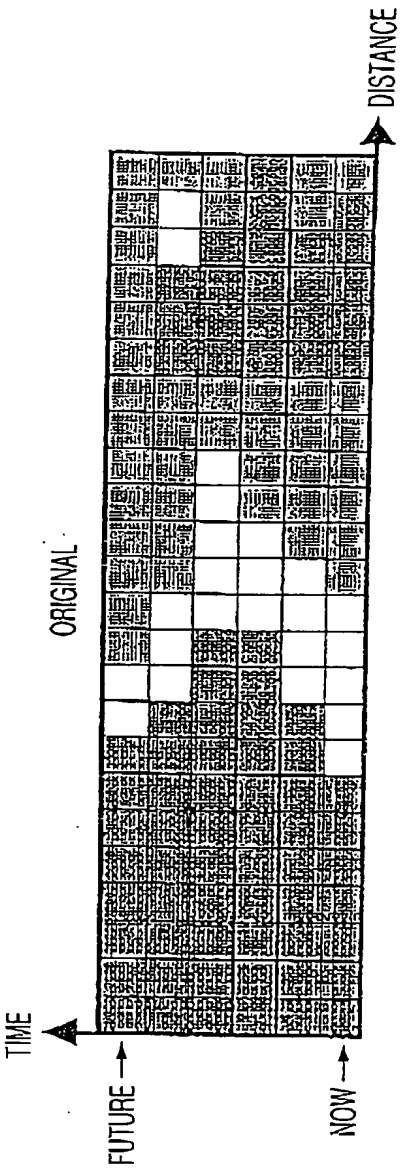


FIG. 21(b)

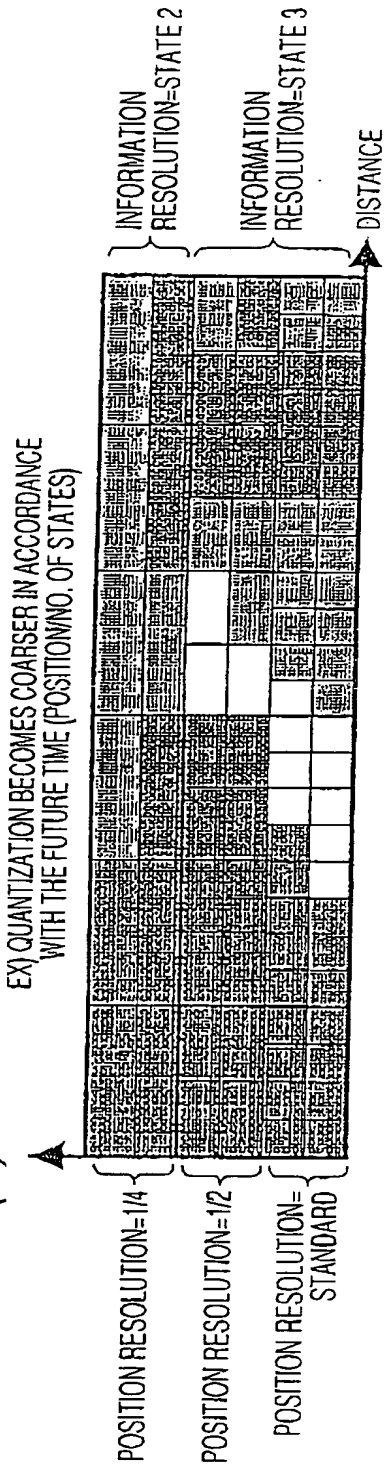


FIG. 22(a)

0. ORIGINAL TRAFFIC INFORMATION (CURRENT MEASUREMENT VALUE+PREDICTION INFORMATION IN THE NEXT TIME ZONE)

PREDICTION INFORMATION IN THE NEXT TIME ZONE (PREDICTION 1) →

CURRENT INFORMATION (NOW) →

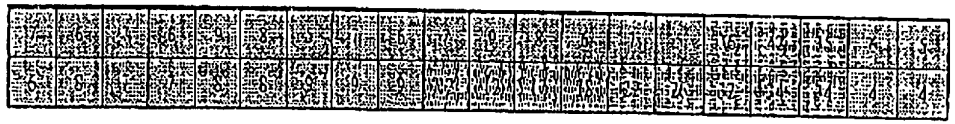


FIG. 22(b)

1. REDUCE THE POSITION RESOLUTION TO HALF (AVERAGE THE TRAFFIC INFORMATION AND ROUND UP THE FRACTIONAL PORTION)

FIG. 22(c)

2. PERFORM QUANTIZATION BY USING A DETAILED QUANTIZATION TABLE

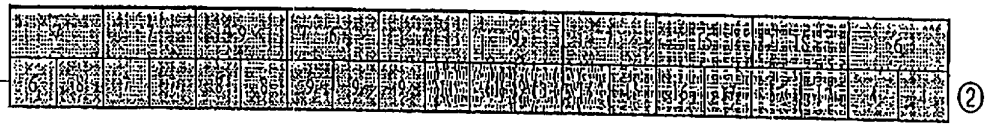


FIG. 22(d)

3. PERFORM QUANTIZATION BY USING A COARSE QUANTIZATION TABLE

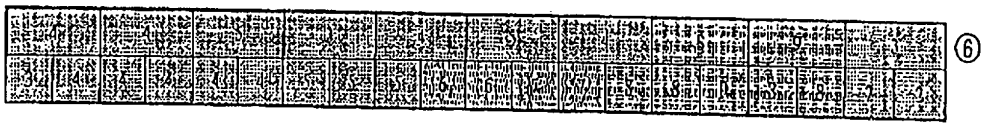


FIG. 22(e)

4. EXTRACT THE DIFFERENCE IN THE DIRECTION OF TIME BY USING A COARSE QUANTIZATION TABLE

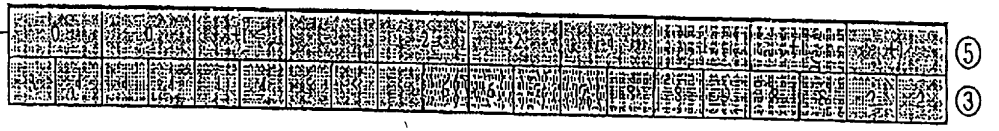


FIG. 22(f)

5. EXTRACT THE DIFFERENCE FROM UPSTREAM BY USING RESPECTIVE QUANTIZATION TABLES

FIG. 23

TRAFFIC INFORMATION QUANTIZATION TABLE
(SPEED QUANTIZATION TABLE)

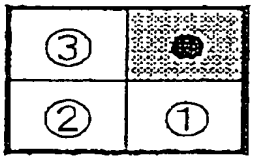
SPEED (km/h)	QUANTIZED VOLUME (CURRENT)	QUANTIZED VOLUME (PREDICTION 1)	QUANTIZED VOLUME (PREDICTION 2)
0	0	0	0
1	1	1	1
2	2		
3	3	2	
4	4		
5	5	3	2
6	6		
7	7	4	
8	8		
9	9	5	3
10~11	10		
12~13	11	6	
14~15	12		
16~17	13	7	4
18~19	14		
20~24	15	8	
25~29	16		
30~34	17	9	5
35~39	18		
40~44	19	10	
45~49	20		
50~59	21	11	6
60~69	22		
70~79	23	12	
80~99	24		
		⟆	
200 OR MORE	30	15	8 (180km/h OR MORE)

FIG. 24

TRAFFIC INFORMATION

HEADER INFORMATION	
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER 1	
REFERENCE SHAPE DATA STRING NUMBER=N	
DIRECTION IDENTIFICATION FLAG (FORWARD/BACKWARD)	
BEGINNING REFERENCE NODE Pa	END REFERENCE NODE Pb
DISTANCE DIRECTION QUANTIZED SECTION LENGTH IDENTIFICATION CODE	
TRAFFIC INFORMATION QUANTIZATION TABLE IDENTIFICATION CODE	
CURRENT INFORMATION: ENCODING TABLE IDENTIFICATION CODE	
PREDICTION INFORMATION: ENCODING TABLE IDENTIFICATION CODE	
NO. OF QUANTIZED UNIT SECTIONS	
NO. OF TIME ZONES OF PREDICTION INFORMATION	
EFFECTIVE TIME OF CURRENT INFORMATION (HH:MM)	
TRAFFIC INFORMATION AT THE BEGINNING (INITIAL VALUE)	
CURRENT TRAFFIC INFORMATION ENCODED BY THE DIFFERENCE VALUE FROM STATISTICAL PREDICTION VALUE	
EFFECTIVE TIME OF PREDICTION INFORMATION 1 (HH:MM)	
POSITION RESOLUTION IDENTIFICATION CODE	QUANTIZATION TABLE NUMBER ★
PREDICTION TRAFFIC INFORMATION ENCODED BY THE DIFFERENCE VALUE FROM STATISTICAL PREDICTION VALUE	
≀	
EFFECTIVE TIME OF PREDICTION INFORMATION Q (HH:MM)	
POSITION RESOLUTION IDENTIFICATION CODE	QUANTIZATION TABLE NUMBER ★
PREDICTION TRAFFIC INFORMATION ENCODED BY THE DIFFERENCE VALUE FROM STATISTICAL PREDICTION VALUE	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER=2	
≀	

FIG. 25



STATISTICAL PREDICTION VALUE OF ● = a① +b② +c③ (WHERE a+b+c=1)

OR = (① + ③) ÷ 2

FIG. 26

① ORIGINAL TRAFFIC INFORMATION DATA		② FFT PROCESSING ON THE TRANSMITTER (ENCODER)		③	④ TRANSMIT DATA		⑤ INVERSE FFT PROCESSING ON THE RECEIVER (DECODER)		⑥ REPRODUCED TRAFFIC INFORMATION DATA		⑦ DIFFERENCE BETWEEN ORIGINAL DATA AND REPRODUCED DATA	
SPEED INFORMATION	CONGESTION INFORMATION	IMAGINARY REPRESENTATION OF ORIGINAL DATA	FFT COEFFICIENT AFTER FFT	QUANTIZATION TABLE	FFT REAL PART QUANTIZATION COEFFICIENT	FFT IMAGINARY PART QUANTIZATION COEFFICIENT	IMAGINARY REPRESENTATION OF RECEIVED DATA	INVERSE FFT COEFFICIENT AFTER INVERSE FFT	SPEED INFORMATION	CONGESTION INFORMATION	SPEED INFORMATION	CONGESTION INFORMATION
6	10	6+10i	733+710i	4	183	178	732+712i	5.75+7.625i	6	8	0	-2
8	10	8+10i	-148.621280158502+272.745586887757i	4	-37	68	-149+272i	5.80532548203367+8.52067306321167i	6	9	-2	-1
7	10	7+10i	-181.863250323693+137.343154572037i	4	-45	34	-180+136i	6.23420537707197+10.5005693367913i	6	11	-1	1
7	10	7+10i	-55.4713983314211-53.4480277168983i	4	-14	-13	-56-52i	4.98101229726206+9.37963794127272i	5	9	-2	-1
8	10	8+10i	25.9411254969544+120.225396744416i	4	7	30	28+120i	6.57322330470037+9.69822330470336i	7	10	-1	0
8	10	8+10i	-145.183119855325+0.951716182933575i	4	-36	0	-144	6.42632544638239+10.2678775231286i	6	10	-2	0
9	10	9+10i	0.190731376517859-15.5227872819433i	8	0	-2	-16i	5.42212789881637+11.570897252652i	5	12	-4	2
9	10	9+10i	-40.5017001665513+42.9151819467876i	8	-5	5	-40+40i	9.60303478897502+13.5436449478559i	10	14	1	4
9	10	9+10i	-43-1.89999999999999i	8	-5	0	-40	10.25+11.375i	10	11	1	1
12	20	12+20i	-56.8878335065916-20.3048255517508i	8	-7	-3	-56-24i	12.3363273923689+20.4980722500786i	12	20	0	0
12	20	12+20i	-14.5874741515445-8.38147222871013i	8	-2	-1	-16-8i	13.1835497555522+21.8443947771475i	13	22	1	2
17	20	17+20i	-39.7513387295353+3.30246359471074i	8	-5	1	-40+8i	18.4482141856231+17.8569282303024i	18	18	1	-2
18	20	18+20i	-8.2253967444162-52.3431457505073i	16	-1	-3	-16-48i	17.4362915010152+18.5183992822018i	17	19	-1	-1
22	20	22+20i	-10.7100733293521+24.5722184685535i	16	-1	2	-16+32i	18.4818265012166+20.2722359810842i	18	20	-4	0
26	20	26+20i	-54.6564177147755-9.85802548068202i	16	-3	-1	-48-16i	25.9598985734648+21.2477459001796i	26	21	0	1
32	20	32+20i	6.72547424221385-31.6849567666283i	16	0	-2	-32i	30.9783455873565+20.9626867300298i	31	21	-1	1
34	20	34+20i	-19-10i	16	-1	-1	-16-16i	34+22.375i	34	22	0	2
34	20	34+20i	-23.9825453766037-1.92473523133878i	16	-1	0	-16	35.4245017307487+21.5758249031537i	35	22	1	2
4	10	4+10i	-27.1316950424174-35.6032000970692i	32	-1	-1	-32-32i	3.71160392966191+8.77366409468866i	4	10	0	0
4	10	4+10i	18.5410942053395-19.8773345808547i	32	1	-1	32-32i	5.59045498433584+12.5736096644321i	6	13	2	3
6	10	6+10i	-40.9411254969543-4.22539674441614i	32	-1	0	-32	6.92677669529664+10.0517766952866i	7	10	1	0
7	10	7+10i	3.86349585961286-50.425875865859i	32	0	-2	-64i	8.57433416713555+12.9347365137643i	9	13	2	3
41	40	41+40i	7.38286115228394+26.1152153945066i	32	0	1	32i	43.1767267351224+38.7596653649321i	44	39	3	-1
45	40	45+40i	-45.5968033955987-35.2659030736415i	32	-1	-1	-32-32i	47.648662535459+39.2058071170952i	48	39	2	-1
46	40	46+40i	-3.00000000000002-58i	32	0	-2	-64i	48+38.625i	48	39	2	-1
38	40	38+40i	5.21142858298211-29.3782351317706i	32	0	-1	-32i	37.9442529747343+37.1731967415274i	38	37	0	-3
43	40	43+40i	3.58242351766113+2.64135695653256i	64	0	0	0	52.3705439377441+38.3813717913725i	42	38	-1	-2
44	40	44+40i	-40.7691513342155-119.976701296968i	64	-1	-2	-64-128i	42.4282703323508+39.5728203051038i	42	40	-2	0
40	40	40+40i	115.225396744416-63.6568542494925i	64	2	-1	128-64i	40.0537084989847+39.7316017177992i	40	40	0	0
45	40	45+40i	-31.2780121723207+19.6548572239245i	64	-1	0	-64	45.9070062491808+40.7573800280564i	46	41	1	1
48	40	48+40i	147.282824585369-255.724903628391i	64	2	-4	128-256i	48.3412467925964+37.9216715822364i	48	38	0	-2
43	40	43+40i	212.623822808768-163.954022106318i	64	3	-3	192-192i	43.3216952098377+38.9048705060301i	43	39	0	-1

FIG. 27

① ORIGINAL TRAFFIC INFORMATION DATA		② FFT PROCESSING ON THE TRANSMITTER (ENCODER)		③	④ TRANSMIT DATA		⑤ INVERSE FFT PROCESSING ON THE RECEIVER (DECODER)		⑥ REPRODUCED TRAFFIC INFORMATION DATA		⑦ DIFFERENCE BETWEEN ORIGINAL DATA AND REPRODUCED DATA	
SPEED INFORMATION	CONGESTION INFORMATION	IMAGINARY REPRESENTATION OF ORIGINAL DATA	FFT COEFFICIENT AFTER FFT	QUANTIZATION TABLE	FFT REAL PART QUANTIZATION COEFFICIENT	FFT IMAGINARY PART QUANTIZATION COEFFICIENT	IMAGINARY REPRESENTATION OF RECEIVED DATA	INVERSE FFT COEFFICIENT AFTER INVERSE FFT	SPEED INFORMATION	CONGESTION INFORMATION	SPEED INFORMATION	CONGESTION INFORMATION
6	10	6+10i	733+710i	1	733	710	733+710i	6.125+9.90625i	6	10	0	0
8	10	8+10i	-148.621280158602+272.745598987757i	1	-149	273	-149+273i	7.83584955307734+9.81404826084081i	8	10	0	0
7	10	7+10i	-181.863253323699+137.340315457237i	1	-182	137	-182+137i	6.76193183039866+10.2377953874i	7	10	0	0
7	10	7+10i	-55.4713982031421-53.4484277168683i	1	-55	-53	-55-53i	7.32835127918787+10.5062773120751i	7	11	0	1
8	10	8+10i	26.9411254969544+120.225396744416i	1	27	120	27+120i	8.20932765030735+9.98169417392415i	8	10	0	0
8	10	8+10i	-145.189119855325+0.961716183533575i	1	-145	1	-145+i	8.18580581859386+9.76320767533622i	8	10	0	0
9	10	9+10i	0.190731976517859-15.5222872819423i	1	0	-16	-16i	8.75920055770712+9.95194658570465i	9	10	0	0
9	10	9+10i	-40.9017001665513+42.9151819467876i	1	-41	43	-41+43i	9.36655308744302+10.3939434767794i	9	10	0	0
9	10	9+10i	-43-1.99999999999999i	2	-22	-1	-44-2i	9.43750000000001+10.00125i	9	10	0	0
12	20	12+20i	-54.8878935483916-20.3048255517508i	2	-27	-10	-54-20i	12.3785026290054+19.6115374881206i	12	20	0	0
12	20	12+20i	-14.5674741515445-8.38147222871013i	2	-7	-4	-14-8i	12.1384947423615+19.6588010323639i	12	20	0	0
17	20	17+20i	-39.7513380295353+5.30246358471074i	2	-20	3	-40+6i	13.0969218083576+19.766891185662i	17	20	0	0
19	20	18+20i	-9.22535874441162-52.3431457505075i	2	-5	-26	-10-52i	17.8760123701316+19.7652374989709i	18	20	0	0
22	20	22+20i	-10.7100733299521+24.6722184665535i	2	-5	12	-10+24i	22.2422829603499+19.6026220654219i	22	20	0	0
26	20	26+20i	-54.9564127147756-9.85802548368202i	2	-27	-5	-54-10i	25.8566734921883+19.2785860749779i	26	19	0	-1
32	20	32+20i	6.72547424221365-31.6348567866283i	2	3	-16	6-32i	31.3618599248675+19.7442204329851i	31	20	-1	0
34	20	34+20i	-19-10i	4	-5	-3	-20-12i	33.375+20.03125i	33	20	-1	0
34	20	34+20i	-23.9885463768037-1.92475231338796i	4	-6	0	-24	33.8592036567471+20.2144116879971i	34	20	0	0
4	10	4+10i	-27.1316960424174-35.6032020830582i	4	-7	-9	-28-36i	3.90287063097159+10.0699089132008i	4	10	0	0
4	10	4+10i	19.5410942053395-19.8773345808547i	4	5	-5	20-20i	4.01415042844684+10.5218714515286i	4	11	0	1
6	10	6+10i	-40.9411254969543-4.22539674441614i	4	-10	-1	-40-4i	5.35317234958266+9.99306826175831i	6	10	0	0
7	10	7+10i	3.85349685861286-30.4259768556591i	4	1	-13	4-52i	7.0155619415876+9.93582863295557i	7	10	0	0
41	40	41+40i	7.38288115228394+26.1152163945056i	4	2	7	8+28i	40.9682989882974+39.6593984574572i	41	40	0	0
45	40	45+40i	-45.9968033955987-35.2659030736415i	4	-11	-9	-44-36i	45.7309644994516+40.2483517125244i	46	40	0	0
45	40	46+40i	-3.00000000000002-58i	8	0	-7	-56i	45.8125+40.03125i	46	40	0	0
33	40	38+40i	5.81142858298211-29.3789361327706i	8	1	-4	8-32i	37.9860274865302+40.0480783769956i	33	40	0	0
43	40	43+40i	0.592423517661130+2.64135685853256i	8	0	0	0	42.8152863435422+40.1584946672352i	43	40	0	0
44	40	44+40i	-40.7631513342156-119.876701296968i	8	-5	-15	-40-120i	43.7093634973042+40.1941059934651i	44	40	0	0
40	40	40+40i	115.225395744416-63.656542494925i	8	14	-8	112-64i	40.0614876286539+40.3597425010281i	40	40	0	0
45	40	45+40i	-91.2780121723207+13.6548572233245i	8	-11	2	-88+16i	45.2466658541078+40.1852058103321i	45	40	0	0
48	40	49+40i	147.282245853958-255.724903572881i	8	18	-32	144-256i	48.0108359718072+39.9760788713555i	48	40	0	0
43	40	43+40i	212.620222999768-160.964322106518i	8	27	-20	216-160i	43.1418234739253+40.1243383749805i	43	40	0	0

FIG. 28

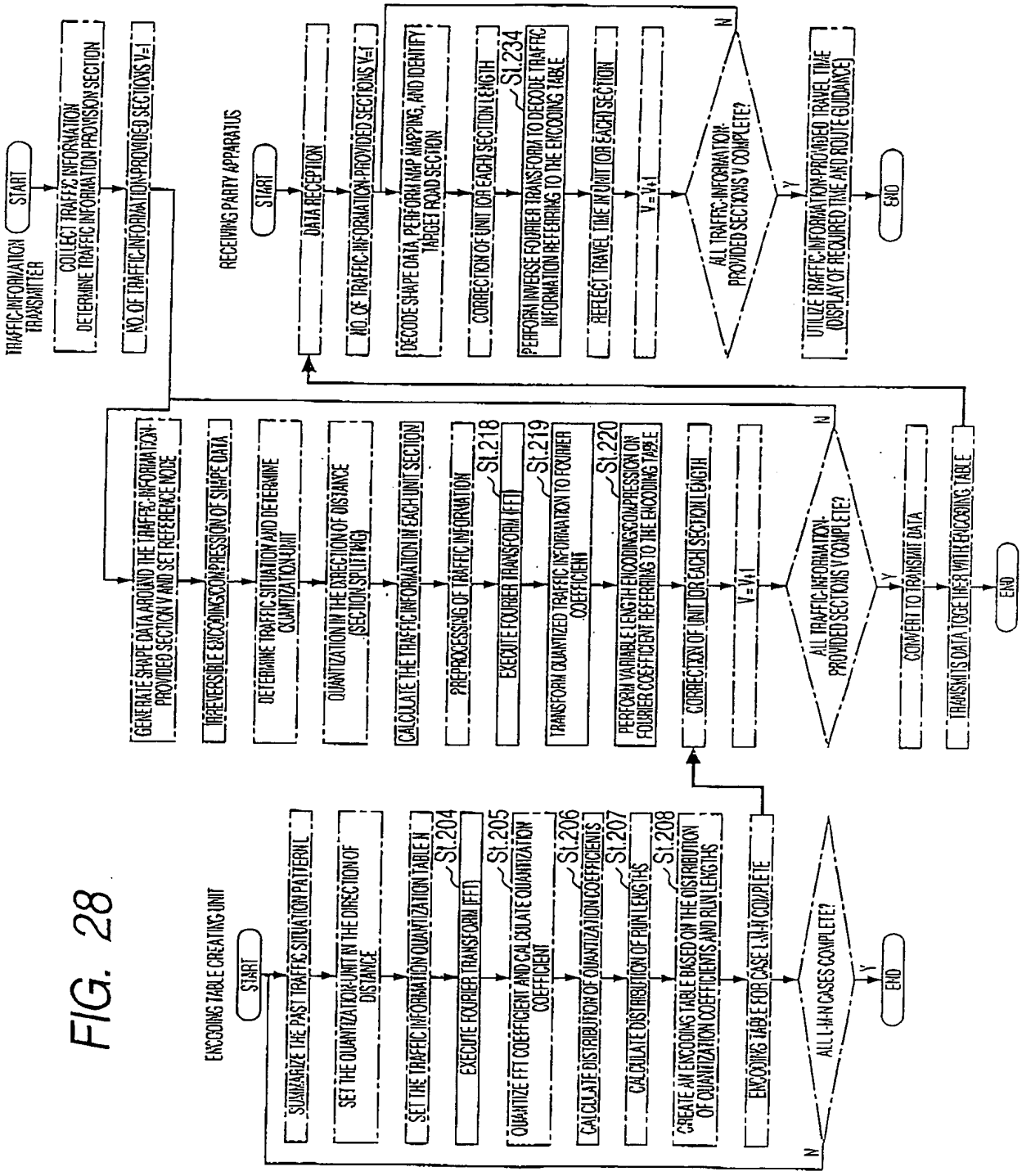


FIG. 29

EXAMPLE OF TRAFFIC INFORMATION IN FFT REPRESENTATION

HEADER INFORMATION	
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER 1	
REFERENCE SHAPE DATA STRING NUMBER=N	
DIRECTION IDENTIFICATION FLAG (FORWARD/BACKWARD)	
BEGINNING REFERENCE NODE Pa	END REFERENCE NODE Pb
TRAFFIC INFORMATION QUANTIZATION TABLE IDENTIFICATION CODE	
ENCODING TABLE IDENTIFICATION CODE	
AMOUNT OF SECTION SPLITTING BETWEEN REFERENCE NODES 2^N	
DATA STRING WHERE FOURIER COEFFICIENTS ARE VARIABLE LENGTH ENCODED IN THE ORDER OF REAL PART TO IMAGINARY PART, AND LOW FREQUENCIES TO HIGH FREQUENCIES	
⋮	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER=W	
⋮	

FIG. 30

EXAMPLE OF ENCODING TABLE OF FFT COEFFICIENTS

SPECIAL CODE		CODE	ADDITIONAL BIT	
EOD CODE		1100	NOT	
ENCODING TABLE		CODE	ADDITIONAL BIT I	ADDITIONAL BIT II (RANGE)
RUN LENGTH	FFT COEFFICIENTS			
0	0	0	0	–
5	0	100	0	–
10	0	1101	0	–
0	±1	1110	1 (±IDENTIFICATION)	0
0	±2	111100	1 (±IDENTIFICATION)	0
0	±3-6	111101	1 (±IDENTIFICATION)	2 (3/4/5/6 IDENTIFICATION)
⋮				

FIG. 31(a)

EXAMPLE OF TRAFFIC INFORMATION IN FFT REPRESENTATION 2
(LOW FREQUENCY COMPONENT/HIGH FREQUENCY COMPONENT SPLIT TYPE)

HEADER INFORMATION	
NO. OF THIS INFORMATION	AMOUNT OF TRAFFIC INFORMATION SPLITTING
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER 1	
REFERENCE SHAPE DATA STRING NUMBER=N	
DIRECTION IDENTIFICATION FLAG (FORWARD/BACKWARD)	
BEGINNING REFERENCE NODE Pa	END REFERENCE NODE Pb
TRAFFIC INFORMATION QUANTIZATION TABLE IDENTIFICATION CODE	
ENCODING TABLE IDENTIFICATION CODE	
AMOUNT OF SECTION SPLITTING BETWEEN REFERENCE NODE 2^N	
DATA STRING WHERE FOURIER COEFFICIENTS ARE VARIABLE LENGTH ENCODED IN THE ORDER OF REAL PART TO IMAGINARY PART, COEFFICIENTS OF BASE FUNCTION TO HIGHT FREQUENCIES	
≀	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER=W	
≀	

BASIC INFORMATION & INFORMATION ON FFT COEFFICIENTS OF LOW FREQUENCY COMPONENT

FIG. 31(b)

HEADER INFORMATION	
NO. OF THIS INFORMATION ※	AMOUNT OF TRAFFIC INFORMATION SPLITTING ※
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER 1	
DATA STRING WHERE FOURIER COEFFICIENTS ARE VARIABLE LENGTH ENCODED IN THE ORDER OF REAL PART TO IMAGINARY PART, COEFFICIENTS OF BASE FUNCTION TO HIGHT FREQUENCIES	
≀	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER=W	
≀	

INFORMATION ON FFT COEFFICIENTS OF HIGH FREQUENCY COMPONENT (PART OF SUBSECTIONS)

FIG. 32(a)

ORDINARY DATA TRANSMISSION ORDER
(DATA IS SEQUENTIALLY TRANSMITTED IN THE ORDER TO LOW FREQUENCY COMPONENTS TO HIGH FREQUENCY COMPONENTS IN ASCENDING ORDER OF SECTION NUMBER)

INFORMATION (FFT COEFFICIENT) IN SECTION NO.=1		INFORMATION (FFT COEFFICIENT) IN SECTION NO.=2		INFORMATION (FFT COEFFICIENT) IN SECTION NO.=V	
REAL PART	IMAGINARY PART	REAL PART	IMAGINARY PART	REAL PART	IMAGINARY PART
45	64	-13	87	53	16
34	-22	8	-32	-89	45
25	-7	5	27	14	-22
0	6	-4	-4	0	19
-2	0	0	3	1	-21
-14	0	2	0	-1	-6
3	-4	1	-9	0	0
0	0	3	0	-5	-3
0	1	0	6	9	0
0	12	0	8	8	0
-2	-5	4	12	4	6
0	0	0	0	0	-12
-1	0	2	0	3	0
3	1	-4	3	5	-3
-2	-7	0	-2	0	0
0	0	0	-1	1	4
0	1	0	7	-3	0
0	0	3	0	-2	1
-6	0	0	0	0	0
3	6	6	0	0	0
4	0	0	4	0	0
1	0	-2	-1	0	-2

FIG. 32(b)

DATA TRANSMISSION ORDER ACCORDING TO THIS SYSTEM
(LOW FREQUENCY COMPONENTS IN ALL SECTIONS ARE TRANSMITTED, THEN HIGH FREQUENCY COMPONENTS ARE SEQUENTIALLY TRANSMITTED)

INFORMATION (FFT COEFFICIENT) IN SECTION NO.=1		INFORMATION (FFT COEFFICIENT) IN SECTION NO.=2		INFORMATION (FFT COEFFICIENT) IN SECTION NO.=V	
REAL PART	IMAGINARY PART	REAL PART	IMAGINARY PART	REAL PART	IMAGINARY PART
45	64	-13	87		
34	-22	8	-32	-89	45
25	-7	5	27	14	-22
0	6	-4	-4	0	19
-2	0	0	3	1	-21
-14	0	2	0	-1	-6
3	-4	1	-9	0	0
0	0	3	0	-5	-3
0	1	0	6	9	0
0	12	0	8	8	0
-2	-5	4	12	4	6
0	0	0	0	0	-12
-1	0	2	0	3	0
3	1	-4	3	5	-3
-2	-7	0	-2	0	0
0	0	0	-1	1	4
0	1	0	7	-3	0
0	0	3	0	-2	1
-6	0	0	0	0	0
3	6	6	0	0	0
4	0	0	4	0	0
1	0	-2	-1	0	-2

FIG. 33

EXAMPLE OF APPARATUS CONFIGURATION

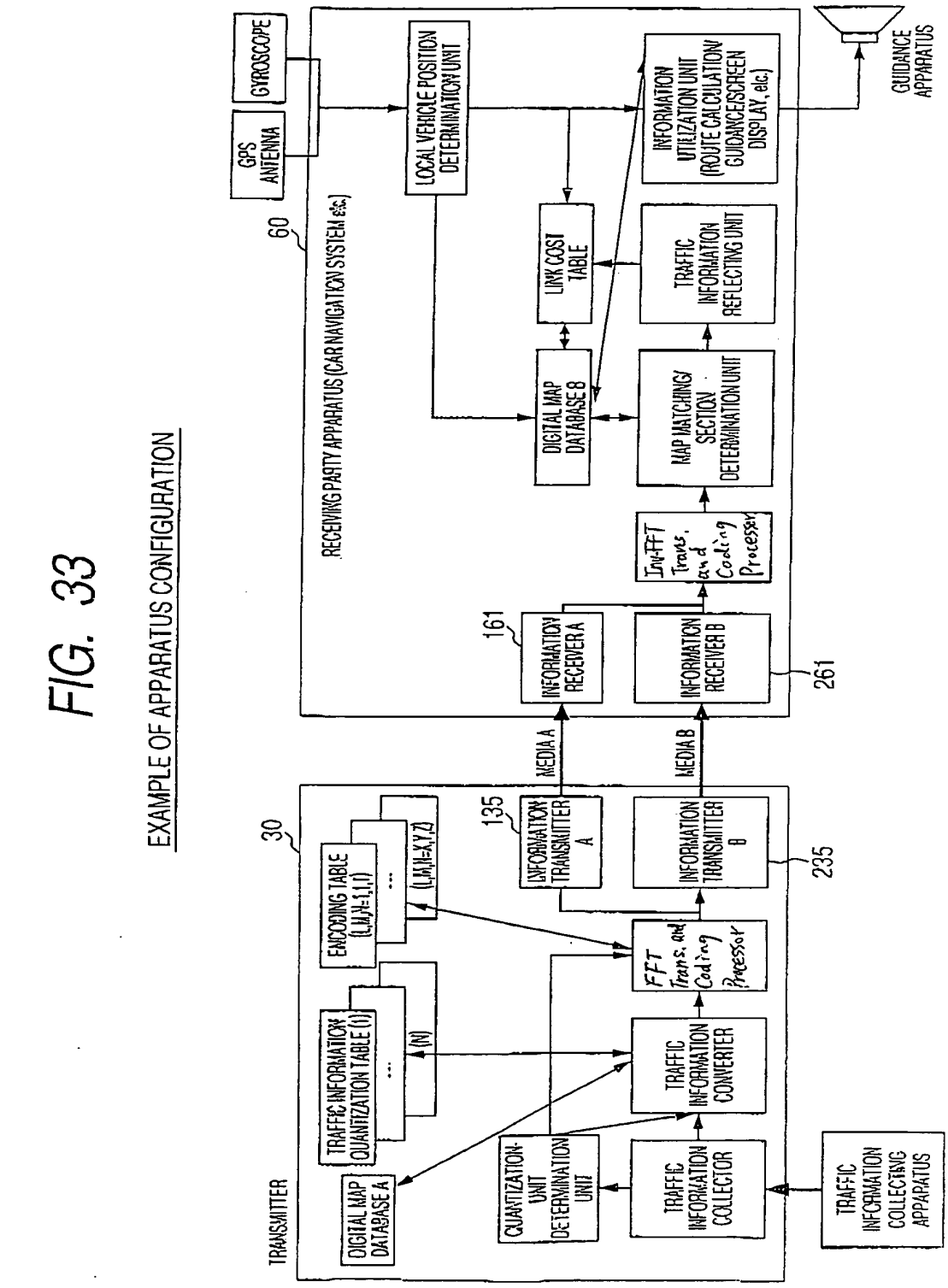


FIG. 34(a)

ORIGINAL INFORMATION

HEADER INFORMATION	
NO. OF THIS INFORMATION	AMOUNT OF TRAFFIC INFORMATION SPLITTING
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER 1	
REFERENCE SHAPE DATA STRING NUMBER=N	
DIRECTION IDENTIFICATION FLAG (FORWARD/BACKWARD)	
BEGINNING REFERENCE NODE Pa	END REFERENCE NODE Pb
DISTANCE DIRECTION QUANTIZED SECTION LENGTH IDENTIFICATION CODE	
TRAFFIC INFORMATION QUANTIZATION TABLE IDENTIFICATION CODE	
CURRENT INFORMATION: ENCODING TABLE IDENTIFICATION CODE	
PREDICTION INFORMATION: ENCODING TABLE IDENTIFICATION CODE	
NO. OF QUANTIZED UNIT SECTIONS	
NO. OF TIME ZONES OF PREDICTION INFORMATION	
EFFECTIVE TIME OF CURRENT INFORMATION (HH:MM)	
TRAFFIC INFORMATION AT THE BEGINNING (INITIAL VALUE)	
CURRENT TRAFFIC INFORMATION ENCODED USING THE STATISTICAL PREDICTION DIFFERENCE VALUE FROM AN ADJACENT POINT	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER=2	
S	

FIG. 34(b)

DIFFERENCE INFORMATION FROM PRECEDING TIME ZONE

HEADER INFORMATION	
NO. OF THIS INFORMATION	AMOUNT OF TRAFFIC INFORMATION SPLITTING
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER 1	
ENCODING TABLE IDENTIFICATION CODE	
EFFECTIVE TIME OF PREDICTION INFORMATION Q (HH:MM)	
CURRENT TRAFFIC INFORMATION ENCODED USING THE DIFFERENCE FROM PRECEDING TIME ZONE AND STATISTICAL PREDICTION DIFFERENCE VALUE FROM AN ADJACENT POINT	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER=2	
S	

FIG. 35

EXAMPLE OF APPARATUS CONFIGURATION (APPLICATION TO PC OR OPERATION SYSTEM)

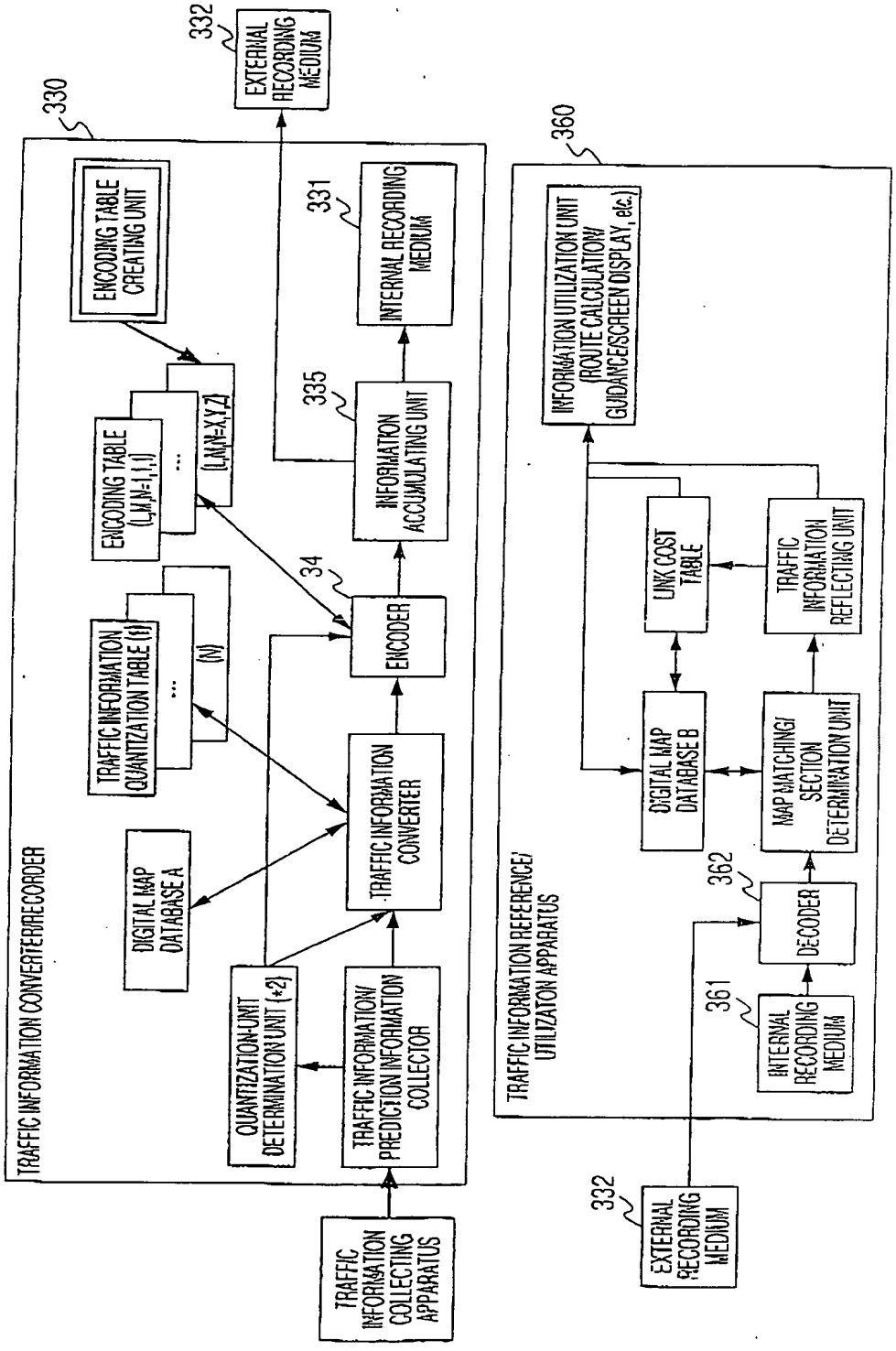


FIG. 36

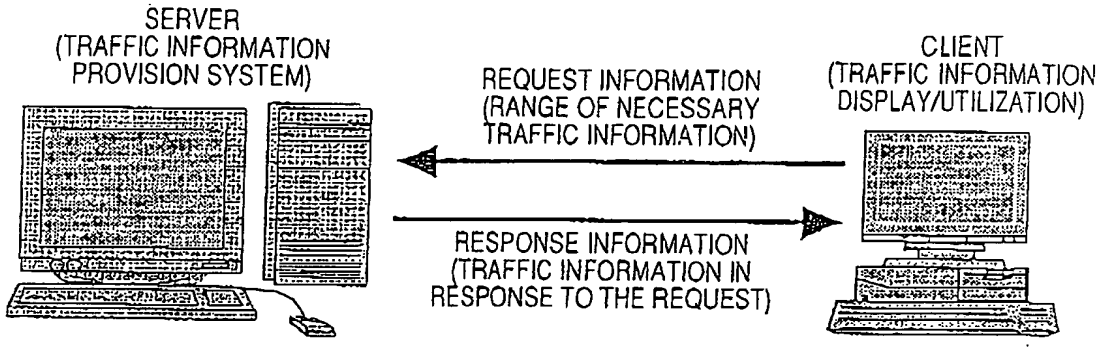


FIG. 37

INFORMATION TRANSMITTED FROM CLIENT TO SERVER <REQUEST INFORMATION>

HEADER INFORMATION (USER ID, ETC.)
DESIRED MAXIMUM DATA SIZE ※1
LATITUDE/LONGITUDE OF LOWER LEFT/UPPER RIGHT OF RECTANGLE ※2
CENTER POINT ※2
PREFECTURAL/COMMUNAL CODE ※2
ROAD SPECIFICATION (ROAD ATTRIBUTE, ETC.) ※2
LATITUDE/LONGITUDE OF BEGINNING/END FOR PATH SEARCH REQUEST ※3
LATITUDE/LONGITUDE OF CURRENT POSITION + TRAVEL DIRECTION ※3

FIG. 38

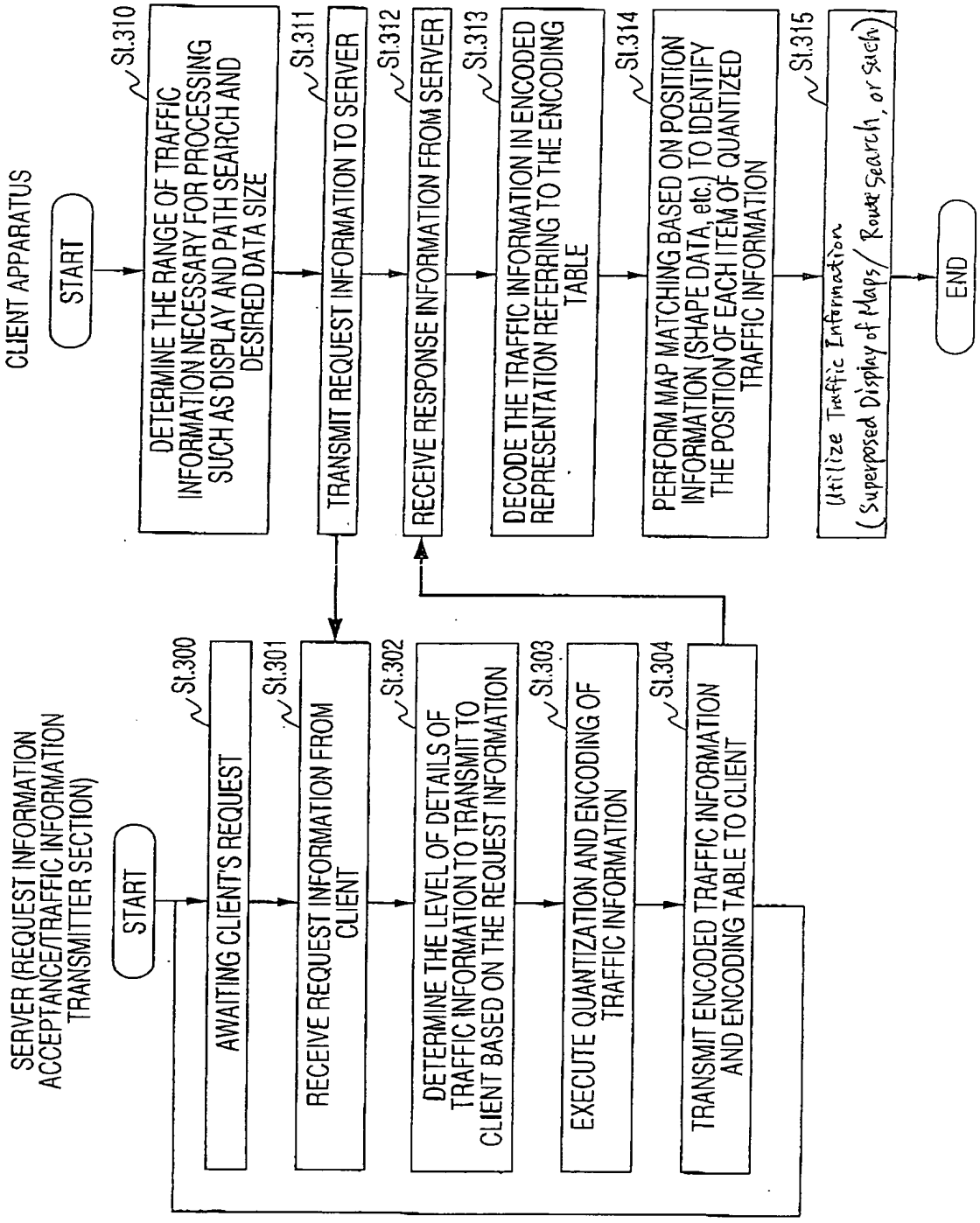

SERVER (REQUEST INFORMATION ACCEPTANCE/TRAFFIC INFORMATION TRANSMITTER SECTION)
START
St.300
AWAITING CLIENT'S REQUEST
St.301
RECEIVE REQUEST INFORMATION FROM CLIENT
St.302
DETERMINE THE LEVEL OF DETAILS OF TRAFFIC INFORMATION TO TRANSMIT TO CLIENT BASED ON THE REQUEST INFORMATION
St.303
EXECUTE QUANTIZATION AND ENCODING OF TRAFFIC INFORMATION
St.304
TRANSMIT ENCODED TRAFFIC INFORMATION AND ENCODING TABLE TO CLIENT
CLIENT APPARATUS
START
St.310
DETERMINE THE RANGE OF TRAFFIC INFORMATION NECESSARY FOR PROCESSING SUCH AS DISPLAY AND PATH SEARCH AND DESIRED DATA SIZE
St.311
TRANSMIT REQUEST INFORMATION TO SERVER
St.312
RECEIVE RESPONSE INFORMATION FROM SERVER
St.313
DECODE THE TRAFFIC INFORMATION IN ENCODED REPRESENTATION REFERRING TO THE ENCODING TABLE
St.314
PERFORM MAP MATCHING BASED ON POSITION INFORMATION (SHAPE DATA, etc.) TO IDENTIFY THE POSITION OF EACH ITEM OF QUANTIZED TRAFFIC INFORMATION
St.315
Utilize Traffic Information (Superposed Display of Maps / Route Search, or Such)
END

FIG. 39

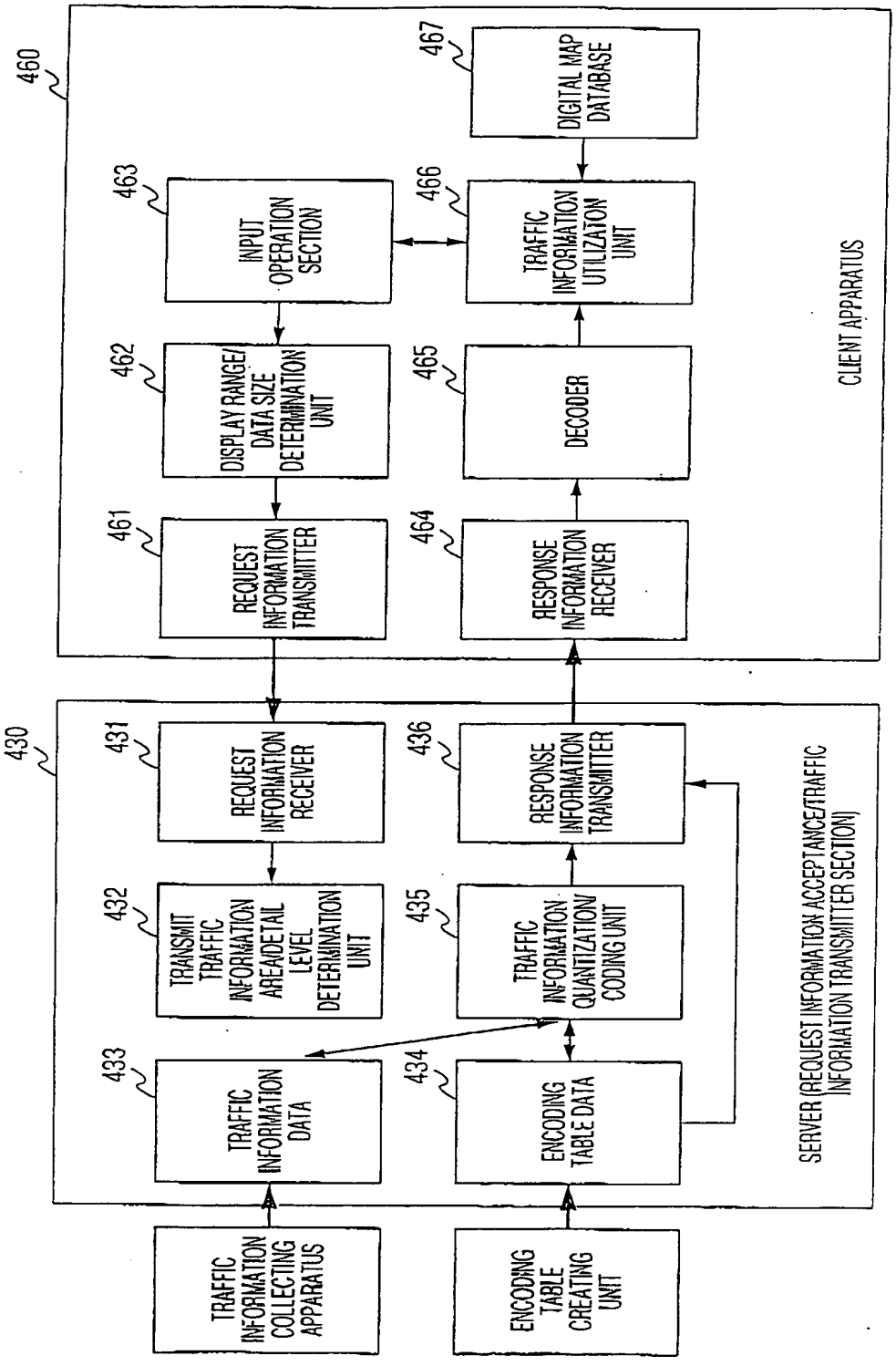

460
CLIENT APPARATUS
467
DIGITAL MAP DATABASE
463
INPUT OPERATION SECTION
466
TRAFFIC INFORMATION UTILIZATION UNIT
462
DISPLAY RANGE/ DATA SIZE DETERMINATION UNIT
465
DECODER
461
REQUEST INFORMATION TRANSMITTER
464
RESPONSE INFORMATION RECEIVER
430
SERVER (REQUEST INFORMATION ACCEPTANCE/TRAFFIC INFORMATION TRANSMITTER SECTION)
431
REQUEST INFORMATION RECEIVER
436
RESPONSE INFORMATION TRANSMITTER
432
TRANSMIT TRAFFIC INFORMATION AREA/DETAIL LEVEL DETERMINATION UNIT
435
TRAFFIC INFORMATION QUANTIZATION/ CODING UNIT
433
TRAFFIC INFORMATION DATA
434
ENCODING TABLE DATA
TRAFFIC INFORMATION COLLECTING APPARATUS
ENCODING TABLE CREATING UNIT

FIG. 40

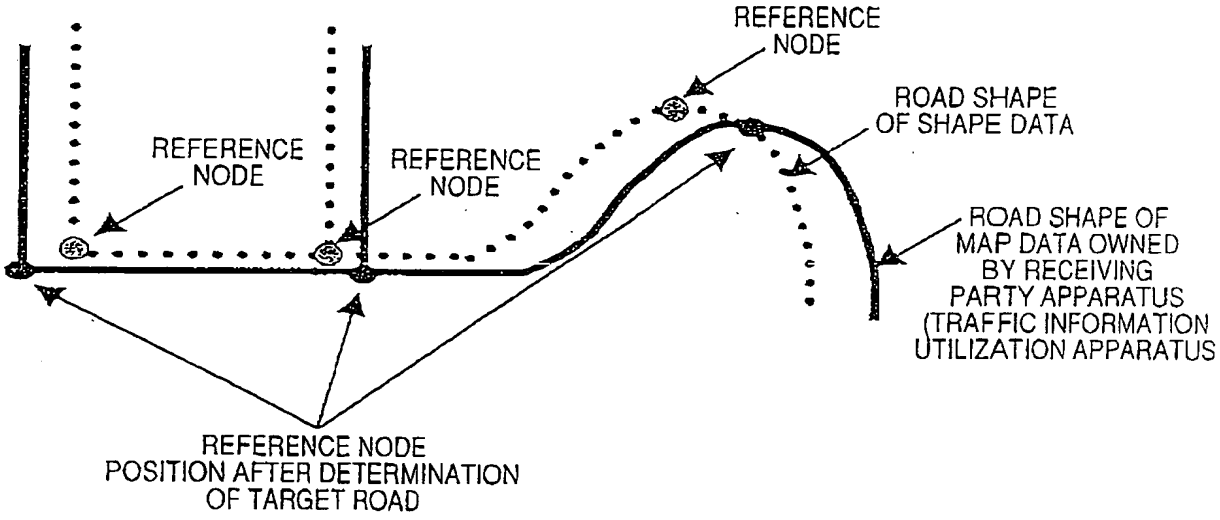

REFERENCE NODE
REFERENCE NODE
REFERENCE NODE
ROAD SHAPE OF SHAPE DATA
ROAD SHAPE OF MAP DATA OWNED BY RECEIVING PARTY APPARATUS (TRAFFIC INFORMATION UTILIZATION APPARATUS
REFERENCE NODE POSITION AFTER DETERMINATION OF TARGET ROAD

FIG. 41

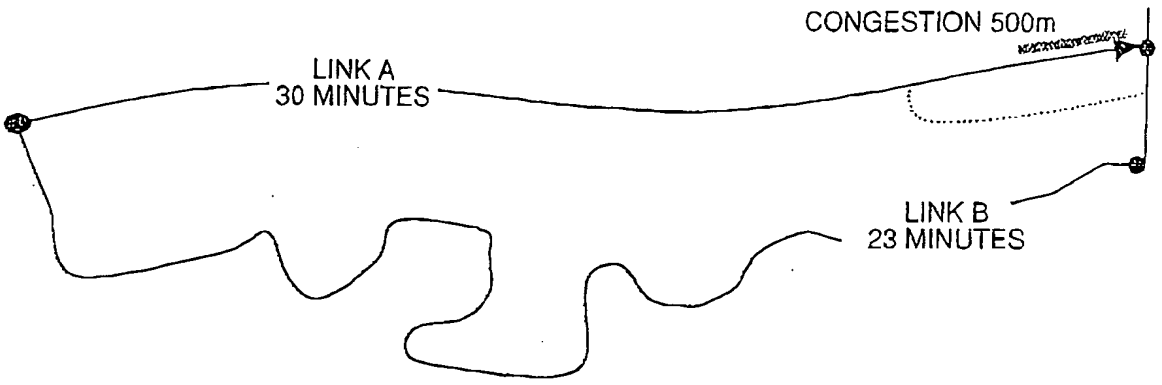


FIG. 42

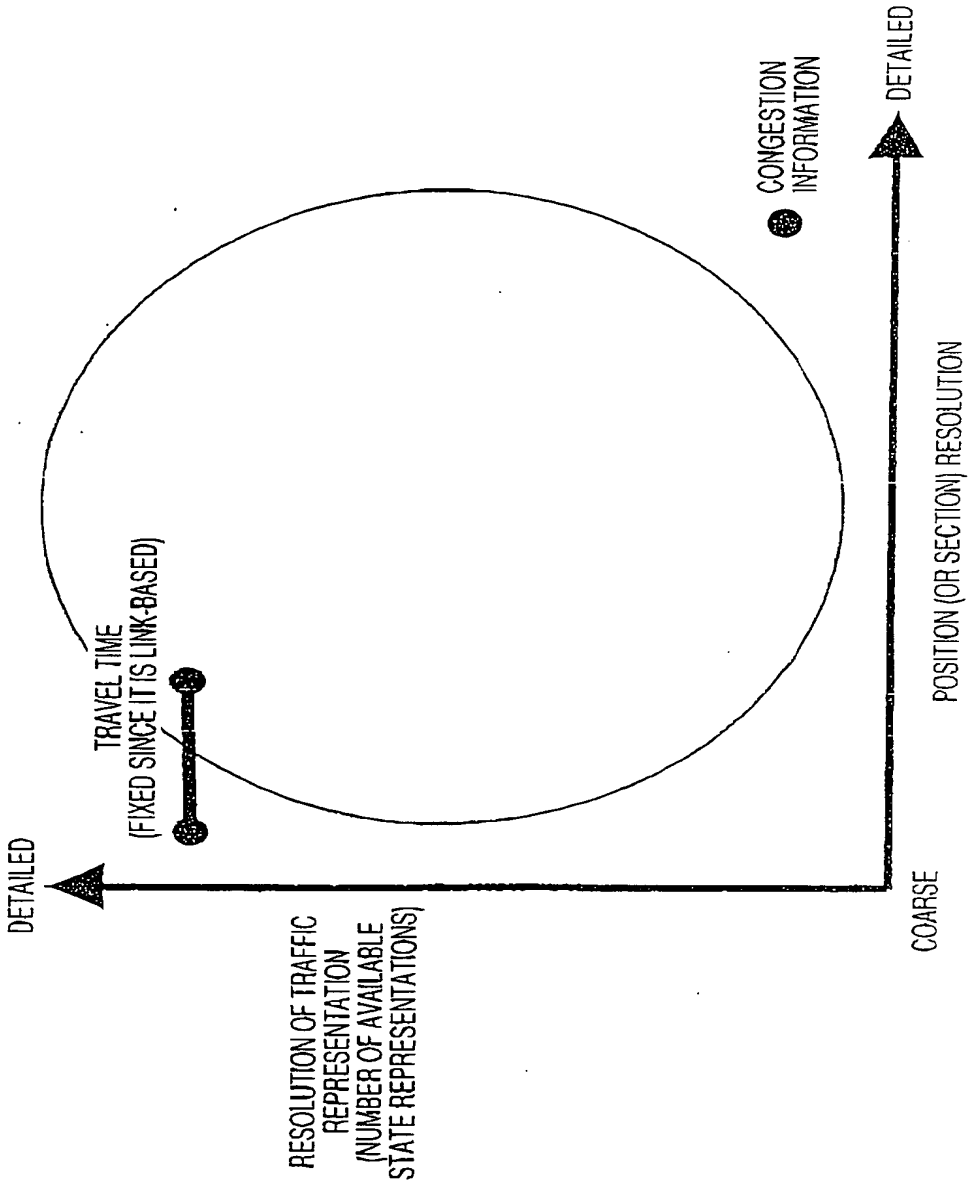

DETAILED
RESOLUTION OF TRAFFIC REPRESENTATION (NUMBER OF AVAILABLE STATE REPRESENTATIONS)
COARSE
TRAVEL TIME (FIXED SINCE IT IS LINK-BASED)
CONGESTION INFORMATION
DETAILED
POSITION (OR SECTION) RESOLUTION

FIG. 43(a)

CURRENT LINK SYSTEM

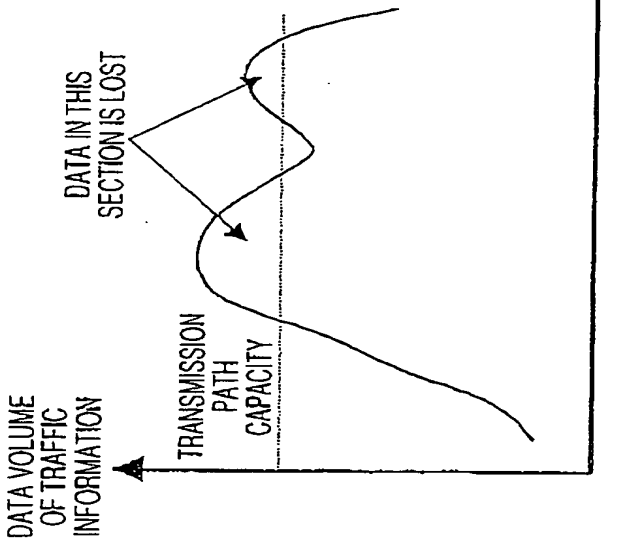


FIG. 43(b)

IDEAL SYSTEM

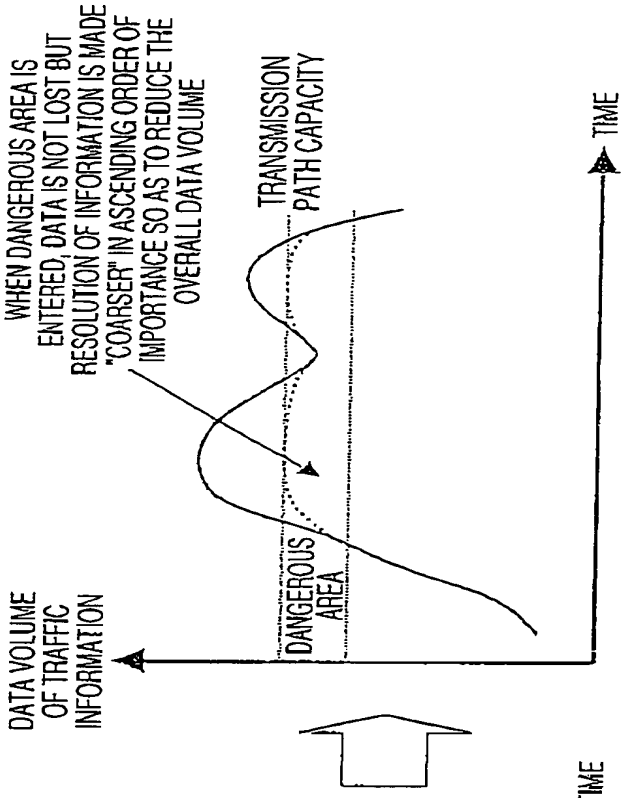


FIG. 44(a)

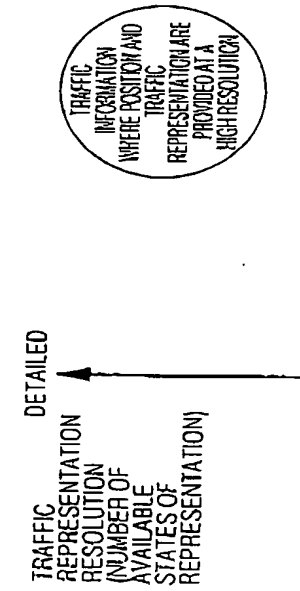


FIG. 44(b)

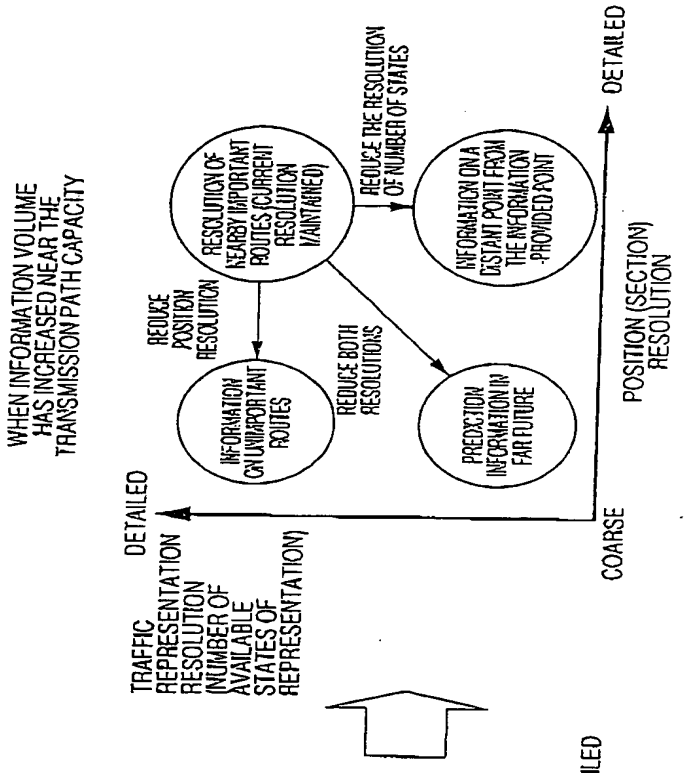
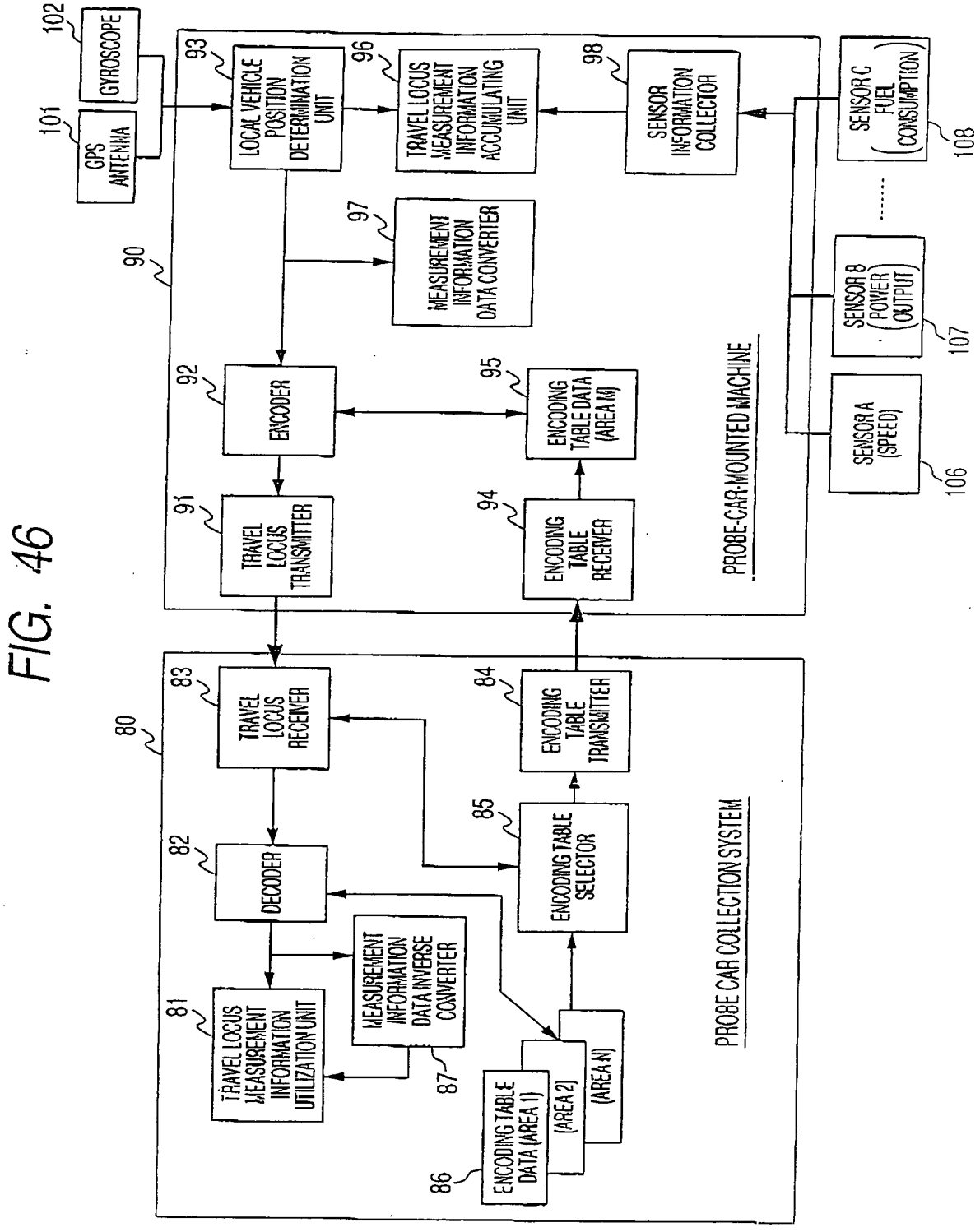


FIG. 45(a)

FIG. 45(b)

FIG. 45(c)

FIG. 46


80
PROBE CAR COLLECTION SYSTEM
81
TRAVEL LOCUS MEASUREMENT INFORMATION UTILIZATION UNIT
82
DECODER
83
TRAVEL LOCUS RECEIVER
84
ENCODING TABLE TRANSMITTER
85
ENCODING TABLE SELECTOR
86
ENCODING TABLE DATA (AREA 1) (AREA 2) (AREA N)
87
MEASUREMENT INFORMATION DATA INVERSE CONVERTER
90
PROBE-CAR-MOUNTED MACHINE
91
TRAVEL LOCUS TRANSMITTER
92
ENCODER
93
LOCAL VEHICLE POSITION DETERMINATION UNIT
94
ENCODING TABLE RECEIVER
95
ENCODING TABLE DATA (AREA M)
96
TRAVEL LOCUS MEASUREMENT INFORMATION ACCUMULATING UNIT
97
MEASUREMENT INFORMATION DATA CONVERTER
98
SENSOR INFORMATION COLLECTOR
101
GPS ANTENNA
102
GYROSCOPE
106
SENSOR A (SPEED)
107
SENSOR B (POWER OUTPUT)
108
SENSOR C FUEL CONSUMPTION